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West Europe Report

(FOUO 36/80)

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WEST EUROPE REPORT

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CONTENTS

POSSIBLE USES OF NEUTRON BOMB EXAMINED

Paris STRATEGIQUE in French Apr-Jun 80 No 6 pp 89-114

[Article by Jean-Baptiste Margeride: "The Neutron Bomb, Part IV: Study of Possible Uses (continued)"]

[Text] We have examined what at present seems to be the main subject--indeed the only one--of the literature devoted to the use of neutron bombs: against tanks. It remains to study what remains, that is, the other uses which may reasonably be contemplated.

Three "basis types" of target are susceptible to the effects of neutrons and, depending upon the case, the gamma radiation produced by atmospheric captures:

--fissionable nuclear material forming the core of fission weapons or the initiators of thermonuclear weapons;
--electronic devices, especially components making use of semi-conducting substances; and
--living matter.[1]

We are going to review possible applications of the neutron weapon in these three areas. Quite obviously our study does not pretend to be exhaustive and should be continued by experts in the various disciplines concerned: specialists in nucleonics, electronics, and biology. Besides, a particular use, attractive at first glance, may prove to be wasteful or harmful in the eyes of the tactician or strategist.

Nuclear Targets

It is known that the action of a neutron flux upon a nuclear missile can bring about disastrous consequences as far as the expected results are concerned: considerable reduction, or indeed complete nullification of the weapon's nominal energy. Incidentally, this fact has led the general staffs to formulate very strict rules for firing, relating the interval between two firings to the distance between the points of explosion and

the energy of the first weapon. This phenomenon goes by the name of "fratricidal effect."

As a matter of fact neutron flux can cause premature initiation of the weapon. From it there is a considerable temperature rise (in noncritical configurations) with the danger of causing damage (deformation, and so forth) such that later, normal firing will yield only considerably reduced energy, if not indeed, none at all.

We can even contemplate destruction of the charge by pure and simple fusion of the fissionable material. In fact, on the basis of the following data:

--effective fission cross section of Pu 239 for rapid neutrons of 2 barns = 2.10^{-24}cm ;
--specific heat of 10 calories/mole (239 grams); and
--melting point of 640°C,

it is easy to calculate that the core of a plutonium warhead will undergo fusion if it is subjected to a flux on the order of 10^{15} neutrons/cm^2.

That value, 10^{15} neutrons/cm^2, is of the same order as that of the flux in a breeder reactor. However, there are fluxes and fluxes. Here the term is employed in its usual sense: the number of objects crossing a given surface in a second. In reactor neutron applications the definition of flux is different: it is the product of the density-- number per cm^3--of the neutrons and their average velocity. In both cases the dimensional equation, $L^{-2}T^{-1}$, is the same. For what we are considering the scientific term is flux density. In any event the heat produced in a breeder reactor is removed by the cooling liquid (sodium) and the plutonium is present there in the form of oxide whose melting point is 2,300°C.

Various antinuclear uses of the neutron weapon can be contemplated. We shall treat the first extensively because it may be the most interesting.

Anti-Ballistic Missile (ABM) Defense of Missile Silos

It is known[2] that the destruction of strategic missile silos can be contemplated only by strikes on the ground with practically direct hits, that is, so that the silo is within the crater produced by the explosion or under the clouds of the fallout materials.

Moreover, if the attacking warheads are not equipped with terminal self-guidance, inspite of improvements in precision, a high probability of destruction can be expected only with firings of relatively high power, which give rise to large radioactive fallouts. But the civilian losses resulting from such fallouts could cause the nation so attacked to retaliate against the enemy's cities with its remaining strategic nuclear resources (SNLE [missile launching nuclear submarines], bombers, and SSBS [ground-ground strategic ballistic missiles]) not destroyed by the strike.

A method of attack more assured of being effective against silos and at the same time less risky--because causing only very small fallout--consists of using maneuverable reentry warheads (MARV) equipped with a system of self-guidance, either by optical reconnaissance or radar, from the site.[3] Under such conditions, the probable circular deviation at impact can be reduced to 10 meters; the attacker can then utilize weapons of several kilotons whose small fallout should not affect metropolitan agglomerations since silos are always installed in barren rural areas.

This method of attacking silos is therefore attractive. However, a warhead capable of maneuvering at the end of its trajectory cannot have a velocity greater than about Mach 2.5 in the low atmospheric layers, that is, below 8,000 to 10,000 meters (size of control surfaces and/or piloting nozzles, acceptable load factor, and so forth).

Therefore, one may contemplate destruction of attacking warheads by ABM missiles. At first glance, the interception can be at any altitude since it is a question of taking out a missile whose explosion can occur only on the ground.

Nevertheless, it appears desirable to provide a margin of safety. One may, in fact, conceive of a system which causes it to explode if the damage inflicted by the ABM is capable of disabling the self-guidance without, for all that, affecting the nuclear weapon itself.[4]

This makes the minimum interception altitude several thousand meters. In addition, because of the distance between silos (several kilometers) an ABM system of very small range could defend only a single one of them. considering the cost of the system (radars, computers, and so forth) it is more economical to provide a missile capable of defending a group of silos. The range thus becomes several kilometers and the same is true for the interception altitude.

How To Select the Warhead for the ABM Missile?

It is known that conventional explosive warheads (shrapnel, for example) have an effective radius against aircraft of only several meters,[5] There it is a question, of targets which, providing a susceptible surface very much larger, are clearly more vulnerable than a warhead whose small size makes possible protection with relatively light but effective armor (for example, titanium).

The use of conventional military warheads therefore cannot be considered unless complete reliance can be placed upon the guidance and precise instant of explosion, which would have to take place when the two moving objects practically coincide in space. Precision of that magnitude still seems very ambitious for short and medium term technology in the face of missiles moving at Mach 2.5.

A second solution might consist of a fissionable nuclear warhead in the kiloton range. It may be reasonably expected that the attacking warhead would be destroyed, or at the very least neutralized, as soon as it passes within the radius of the fireball, a condition much more comfortable than in the case of the conventional warhead. This type of solution is therefore rather attractive. However, it has certain disadvantages:

--temporary blinding of defense radars;
--blast and thermal effects on the ground if the altitude of the interception is relatively low (several kilometers); and
--possible fratricidal effects upon defense weapons if several attacking warheads come at short intervals.

The third solution might be that of a warhead consisting of a neutron weapon with reflector, of relatively narrow field. In fact, at rated energy equal to that of a fission missile (fusion and fission initiations):

--the thermal effects are greatly attenuated;
--the blast effect is also much smaller and causes no damage on the ground; and
--last, the neutron concentration in a limited solid angle directed upwards has a greater chance of diminished fratricidal effects among successive interception weapons.[6]

The graph (Figure 11) shows, for a 1-kiloton fusion weapon and distances varying between 100 and 300 meters from the point of explosion, the average number of neutrons per square centimeter in the beam defined by the reflector (Figures 12 and 13) at an explosion altitude of 5,500 meters.[7]

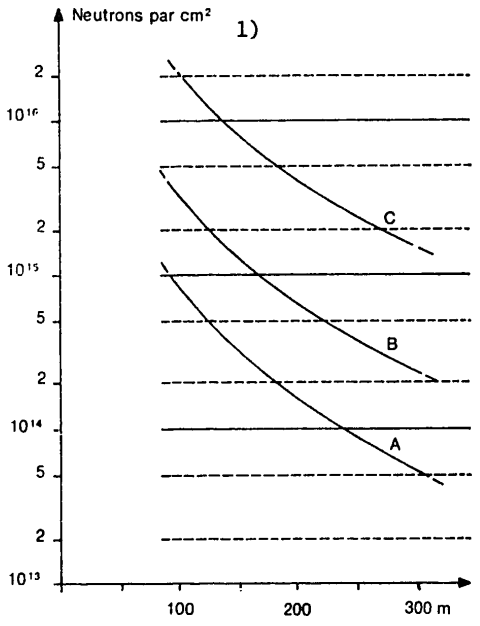
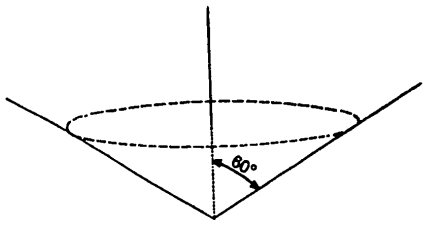


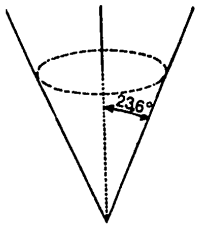
Figure 11.

Key:
1) neutrons per square centimeter
2) radial distance from point of explosion



Solid angle of π steradians

Figure 12



Solid angle of $\pi/6$ steradians

Figure 13

We have considered that the reflector efficiency is on the order of 80 percent (see Chapter III) and we have examined the following three cases shown by the curves of the graph:

A -- no reflector, or solid angle of 4 π steradians;

B -- reflector with solid angle of π steradians (half angle at the apex of the irradiation cone of 60°); and

C -- reflector with solid angle of $\pi/6$ steradians (half angle at the apex of the irradiation cone of 23.6°).

Core fusion being obtained with values of some 10^{15} neutrons/cm^2 , it can be seen that it could occur, with an ABM warhead of 1 kiloton, at distances from the explosion of:

--about 70 meters for a weapon without reflector;
--about 130 meters with a reflector concentrating the neutrons within a solid angle of π steradians; and

--about 270 meters with a reflector concentrating the neutrons within a solid angle of $\pi/6$ steradians.

Of course, the attacking warheads can be provided with protection against neutrons. But such protection can only be of limited nature for reasons of weight and volume. Moreover, the ABM is not limited to 1-kiloton fusion but can be of 2 kilotons, or 5 kilotons which would nullify the protection.

Moreover, an elementary calculation confirms that the blast and thermal effects on the ground from neutron weapons of from 1 to 5 kilotons exploding at an altitude of 5,500 meters are practically nil:

--peak pressure below 0.01 kilogram per square centimeter (threshold of window pane breakage); and
--heat flux less than that causing first degree burns.

What would an ABM system--missile and peripherals--of this kind be like?

Missile--For an interception altitude on the order of 5,000 to 8,000 meters the missile's ceiling should be about 10,000 meters so that it is capable of covering a certain area (group of silos).

Figure 14 shows the relation between the weight of an anti-aircraft or ABM missile and its maximum interception altitude. In the present state of the art a 10,000-meter ceiling requires a missile of about 400 kilograms. However, the missiles used to establish the curve are of advanced technology, yet obsolescent. In a few years a 10,000-meter ceiling should be attained by a missile from 250 to 300 kilograms.

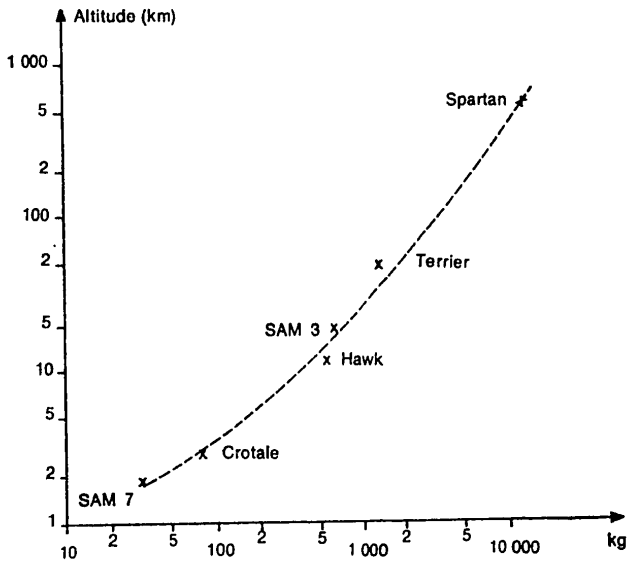


Figure 14.

Weight of missile (according to Jane's Weapons Systems

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Radars--The range of the detection and warning radar must be great, on the order of 1,000 kilometers. The equipment would therefore be large. It seems that the technique of electronic antenna sweeping should be adapted.

The tracking and guidance radar or radars can be of much smaller size since their range, for warheads of radar equivalent sections of from one to a few square decimeters, can be limited to about 80 kilometers. Here again, the technique of electronic antenna sweeping seems to impose itself, especially since it enables numerous tracks to be followed simultaneously.

Of course, the tracking radars are associated with computers in order to discriminate between actual warheads and possible light decoys. Such discrimination would be facilitated by a relatively low interception altitude.[8]

We shall see that the action of neutron ABM missiles upon maneuverable warheads are not limited to the nuclear charge but should also affect the sensors and electronic devices of the self-guidance.

We would not want to end discussion on this point without bringing up a problem which might prove to be of considerable importance.

The ABM system sketched here would be intended for defense of SSBS silos against nuclear ground strikes. Could it also be used for defense of large agglomerations?

All depends upon the power of the possible aggressor's anticity weapons. Let us assume that the normal interception altitude of our ABM is on the order of 5,000 meters. Knowing this, the possible attacker should adjust his weapons so that the explosion occurs before interception, at 8,000 or 10,000 meters, for example. Under such conditions damage on the ground will not be great except in the case of very high-powered weapons. To give some idea, an explosion of 100 kilotons at 8,000 meters at point zero will produce practically no irradiation, and only a heat flux lower than the limit for first degree burns (sunburn) and as far as blast is concerned, only very slight damage to buildings.

At that same altitude a 5-megaton explosion will cause considerable havoc over hundreds of square kilometers.

It is therefore conceivable that, to face an attacker employing numerous precise nuclear warheads of relatively low energy--in the 50 to 200-kiloton range, for example--the defender might contemplate the protection of its large cities by a mini-ABM system rather easy to conceal: radars in hangars which can be opened very rapidly and, of course, obviously assuming conventional anti-aircraft defensive operations; missiles mounted upon vehicles and screened from detection by satellite up to the moment of firing, and so forth.

As an extreme one can imagine that a nation could, with limited risks, enter into an all-out nuclear war by unmasking a mini-ABM system at the time it attacks the enemy's cities.

This naturally poses a quantitative problem: mini or not, every city defended by an ABM system would have to be defended by a number of missiles at least equal to the number of attacking warheads. However, for the time being, we believe it must be reasserted that it would be imprudent to trade off, systematically, the power of strategic weapons for quantity, that is, replace all single megaton warheads with multiple warheads (MRV, MIRV, and MARV) of relatively low power (on the order of 100 kilotons).

Other Antinuclear Uses

In truth, the other possible antinuclear uses of neutron weapons seem limited. Each of them, as a matter of fact, must be so restricted that putting them into practical operation seems difficult indeed. Other possibilities are of no interest, the neutron weapon contributing nothing more than conventional means do.

Let us restrict ourselves to a few examples.

A. Defense of theater forces against rockets and tactical nuclear missiles.

The neutron warhead should enable the nuclear warhead to be neutralized. But provided that the interception-altitude is great enough (more than 2,000 meters) so that the risks on the ground are small or nil.

But this type of employment involves the deployment of a large number of missiles and radars (detection, tracking, guidance) upon the battlefield, all of this equipment being mobile. It also implies the capability of discriminating between rockets and missiles carrying nuclear warheads and those weapons with a conventional explosive or chemical charge. In the present state of the art this urgent distinction is impossible and the same would be true were a great deal of time available. Last, such use cannot be accepted without coordination of the aircraft and friend ground forces light aviation (ALAT) (pilot blinding). Now, an enemy missile or rocket can appear at any given instant at any place at all upon the battlefield....

Last, one can hardly foresee employment of an ABM (even if it be a mini-ABM) against any shell of large caliber--175 or 203 millimeters (assuming the caliber can be evaluated at a distance!)--upon the supposition that it may be a shell with a nuclear charge....

B. Preventive attack against nuclear missiles upon mobile carriages (Scud B, SS12, and so forth).

First of all let us note that the objectives would be situated at great distance from the line of contact. Their detection therefore depends upon aerial or satellite reconnaissance. But experience proves that equipment not in motion can be easily concealed from this type of observation. In the majority of cases they can be spotted only in the course of movements. One difficulty indeed disappears but another arises because, to be effective, the explosion must occur at a very short distance from the target.[9] Considering the probable circular deviation and the movement of the target, it seems difficult to achieve a high probability that the distance between point of explosion and target will be less than about 150 meters, the order of magnitude necessary for effective results.

C. Cruise missiles.

Some writers have mentioned the possibility of attacking cruise missiles in flight with neutron weapons. Cruise missiles in fact are targets highly susceptible to radiation (nuclear charge, sophisticated electronics). However, the difficulty of destroying them does not reside in their capability of resisting conventional projectiles, but in the difficulty in detection and acquisition of a missile flying at very low altitude, whose radar signature is small (equivalent surface on the order of 0.1 to 0.15 square meters) and which may appear at any point at all upon a land or sea frontier.

Defense against these missiles therefore seems to depend upon conventional anti-aircraft defenses (fighters, and anti-aircraft missiles and guns) assisted by an adapted detection system, that is:

--in regions without geographical relief, by radars installed upon artificial high points (towers, captive balloons); and

--in mountainous regions, by radars carried by aircraft (AEW [Aerial Early Warning] system).

It will be observed that, if the defense intends to use neutron weapons against cruise missiles, the altitude of the explosion, necessarily very low, would risk causing more than negligible concomitant damage to the territory defended if ever the defense missile intercepts the attacking cruise missile above or in the vicinity of an agglomeration.

D. Strategic missiles in silos

Neutron weapons might conceivably be used to attack strategic missiles in silos (antinuclear and anti-electronic effects).

It might in fact be hoped to destroy the components sensitive to radiation without causing large radiation fallout even though the missile explodes upon the ground because of the low power of the fission initiation.[10, 11] As a matter of fact:

--either the weapon explodes upon direct contact with the silo door and the mechanical effects suffice to destroy it and cause serious damage to the missile. It would indeed be more economical to use a conventional fission weapon of very low energy;

--or else the weapon explodes at a certain distance and the silo door, of concrete 1.5 to 2 meters thick, reduces the radiation by a factor of from 10^6 to 10^8, which makes it too small to inflict the damage contemplated.

Electronic Targets

Under this rather vague heading we shall combine everything concerning:

--computers, on-board or not;
--sensors (optical, infrared, radar);
--electronic and optical-electronic circuits for transmission of data or control, as well as amplifiers;
--memories, whose operating principle depends upon electrical or magnetic charges; and
--solar cells for electric power supply.

For a long time it has been known that all these systems are sensitive to strong neutron and gamma, as well as beta, radiation.

For example, there have been observed overvoltages in conductors which can cause their destruction. In addition, the performance of semiconductors is impaired or destroyed as a result of alteration of the crystalline structure and destruction of certain constituent elements.[12]

The memories are also sensitive to the direct or indirect[13] action of radiation. In this respect "living" memories (RAM), that is, which can be erased and receive new data, prove to be more fragile than "dead" memories (ROM) which are inscribed only once--permanently.

The order of magnitude of radiation sufficient to inflict irreparable damage upon electronic devices (in spite of the redundancy of some subassemblies) remains secret. At the end of 1977, according to AVIATION WEEK AND SPACE TECHNOLOGY good protection would have been considered to consist of hardening[14] of the on-board electronics to survive a 1-megaton explosion at a distance of 10 kilometers in space vacuum.

Confining ourselves to neutrons alone, that data corresponds to a flux density on the order of 10^{14}neutrons/cm^2. If we suppose--and this is

undoubtedly optimistic--that progress in hardening in the medium term future (about 1985-1990) would make it possible to gain by an additional factor of 10, the calculations which enabled Figure 11 to be drawn show that the neutron flux density of 10^{15} N/cm^2 is obtained at 5,500 meters altitude, at the distances shown in the following table.

Table: 10^{15} N/cm^2 at 5,500 Meters Altitude[15]

Fusion energy of the weapon	Without reflector	Reflector with solid angle of π steradians	Reflector with solid angle of $\pi/6$ steradians
0.5 kiloton	70 meters	130 meters	275 meters
1 kiloton	90 meters	175 meters	350 meters
2 kilotons	125 meters	230 meters	420 meters
5 kilotons	180 meters	320 meters	580 meters

At low altitude these distances are considerably reduced; especially in the case of the greatest, since the term representing absorption by the air is ℓ^{-R235} instead of ℓ^{-R470}.

Let us now examine the possible uses of neutron weapons against targets sensitive at the electronic level. Of course, the several examples which follow are not exhaustive and should be followed by specialists.

A. Ballistic missiles with final self-guidance

We have previously seen that the use of neutron weapons makes it possible to contemplate putting the nuclear charge on the initiator or a thermonuclear charge out of service.

In the case of missiles with maneuverable warheads (whether the maneuvers be predetermined, or optically, infrared, or radar self-guided) the effect of the radiation upon the on-board systems can also prove destructive. Only experts are prepared to say which part, nuclear or electronic, is the more sensitive, the easier to harden, and so forth. For our part we consider that putting the nuclear weapon out of service would be the preferred objective. In fact, one can imagine installing in the warhead a simple system, not sensitive to radiation (a pressure sensor, for example) which would give the firing command even though the fragile electronic components were destroyed. Naturally, this ignition itself has recourse to electronics but here it is a matter of relatively simple components far less sensitive than those which make up the terrain reconnaissance and self-guidance system.

B. Very low altitude sea-sea missiles

These are air-air with conventional explosive charge of the MM 38, Otomat, Styx, etc class which, launched at great distance from the enemy ship (several tens of kilometers) are first directed toward their targets, and then self-guided (infrared or radar) when they are within sight range (limited range at very low altitude because of the earth's curvature).

At sea the explosion of the defensive weapon, although occurring at very low height, cannot cause concomitant damage. The essential problem indeed seems that of the time interval between detection of the missile and the instant the defense missile must intercept it.

A simple calculation shows that the attacking missile, on a trajectory at 5 meters altitude, is detected at about 16 kilometers distance by a radar situated 15 meters above the water. To avoid radiation effects upon the crew interception must take place at a minimum of 2 kilometers. If the missile is traveling at Mach 0.85 the 14 kilometers between detection and interception are traveled in 50 seconds, a time during which it is necessary to pass from detection to acquisition and radar tracking, verify that it is not a friendly aircraft (identification), prepare the defense missile (deactivate the nuclear safeties, orient the ramp, and so forth), and ignite. To which must be added the flight time of this guided missile from the launching ship.

The maximum being 50 seconds, it can be seen that this use demands highly advanced automation of all the operating sequences. But it appears that it should not be eliminated a priori, particularly for naval formations which include an aircraft carrier since the alert can be given distinctly sooner by means of an airborne radar (aerial early warning), to the extent that a radar carried by a light vehicle (helicopter) would be capable of detecting an object of small equivalent surface[16] at very great distance.

C. Air-surface missiles

A threat similar to the preceding, the attacking missile being launched from an airplane or helicopter. Some of these missiles have a flight profile similar to that of low altitude sea-sea missiles. Others fly at great height and finish by diving at the objective. In the latter case, detection, which is earlier, provides conditions of operation which are less constricting.

D. Very long range air-air missiles

These are air-air missiles of "fire and forget" type, remotely and then automatically self-guided; the AIM 54 Phoenix[17] is a good example. Its very elaborate electronics cannot help but be very sensitive to strong radiations. Again, the threatened aircraft would have to be armed with defensive missiles equipped with neutron warheads....

E. Strategic missiles in silos

As in the case of the nuclear charge (see previous discussion) it can be believed that a concrete door of sufficient thickness (1.5 to 2 meters) should reduce radiation to the point where the on-board electronics remain unimpaired.

F. Satellites

Communications, observation, and antisatellite satellites necessarily are equipped with very elaborate electronic systems, sensitive to the effects of radiation. Besides, the various radiations are not absorbed in the space vacuum so that the decay in intensity is expressed by $1/R^2$ instead of $1/R^2 e^{-R/K}$ as in the atmosphere, which considerably increases the range, the radiation rates being equal.

However, since explosions in space are involved, therefore without effects on the ground, one can hardly see any reason for not simply using nuclear weapons of conventional type against these targets. The power of such weapons must nevertheless be limited, as a function of the interception altitude, in order to avoid the risk of disturbing radio telecommunications by the effects upon the very high atmospheric layers.

Actions Against Combatants

In a first approximation the conditions under which neutron weapons can be used against combatants seem close to those for military gases. It is a matter of exerting rapid and lethal action without causing material destruction. This general concept, however, has to be somewhat refined. We shall return to it in the conclusion (Part V).

Troops in the Open

As a general rule the panoply of conventional resources provides very suitable effectiveness. Nevertheless, when the area to be neutralized is large, problems arise: concentration of attack facilities (artillery, aircraft, ramps) and logistics, for the tonnages of munitions are considerable. Last, except when a prodigious quantity of projectiles per unit of area is expended, neutralization of bombarded formations is only short-lived.[18] In the case of neutron weapons the small number of projectiles to be used eliminates the logistic difficulties--at least as far as tonnages to be transported are concerned--and those of launching facilities. Among the types of objectives which may be considered are:

a) troops in the field, not under cover

Here are involved troops occupying defensive works erected in haste (trenches, individual foxholes, collective weapons emplacements, and so forth) without earth cover from logs or planks. A layer of earth from

1 to 1.5 meters thick would considerably attenuate the radiation (see Figure 7).[19] However, let us note, as we have pointed out previously, that although about 90 percent, approximately, of the radiation comes directly from the point of explosion, 10 percent (atmospheric diffusion) seems to come from the sky as a whole. Consequently, personnel under shelter but present at firing openings would be locally (head, torso) exposed to greater radiation than a calculation based solely upon the protective layer indicates.

b) troops in defensive situations in localities or wooded regions

Even when held by very limited numbers these regions provide excellent possibilities of stopping armored formations provided that the defense is by well-trained and determined personnel.

The attacker is therefore confronted with a dilemma: either successively liquidate each pocket of resistance, at the cost of considerable loss of time,[20] or else resort to the heaviest resources, that is, an enormous concentration of fire or a tactical nuclear weapon; but he must thereafter traverse a devastated region, which is difficult for vehicles on caterpillar treads and impossible, before clearing, for those on wheels.

In such a situation the neutron weapon is an obvious solution since in wiping out the defenders it effects practically no change of the infrastructure.

This employment, of course, while admissible in a wooded region, becomes impossible in a locality from which the population has not been evacuated.

c) urgent, imperative mopping up of a region

Here is a local tactical situation of very great importance, fraught with operational, indeed strategic, consequences. There can be mentioned, for example:

--mopping up preliminary to establishing a bridgehead, either for coastal landing or crossing a stream of water (Figure 15);

--conversely, mopping up, by the defnese, of the beginnings of an enemy bridgehead;

--eliminating enemy elements parachuted at a strategic missile silo site for purposes of sabotage (blocking the doors by means of explosives, or penetration of the doors with large caliber explosive shells, and so forth)[21];

--elimination of unprotected enemy antitank weapons preliminary to an attack upon a limited front. It is a matter of, for that one of the adversaries

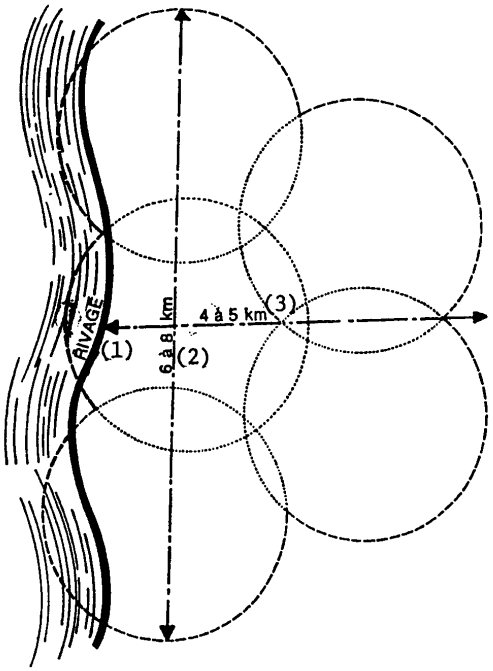

Figure 15.

Key: 1) bank 2) 6 to 8 kilometers 3) 4 to 5 kilometers

which is going to attempt a breakthrough, eliminating, preventively, along the front of its emergence, all antitank resources which have little or no protection (antitank missile squads on the ground, on vehicles or light armor, and LRAC [antitank rocket launching] squads), which would give it an obvious tactical advantage.

We would like to stress the fact that such elimination might be extended to the defense's antitank helicopter crews of the attacker, because of error in calculation, gave warning of its intentions soon enough for the helicopters to have time to position themselves at a distance for firing their missiles.

The helicopter in fact provides no protection at all for its crew against radiation. That is a problem which merits special study

--mopping up an infrastructure which must be taken intact (bridge, airport, and so forth).

Piloted Aircraft

The use of neutron weapons in anti-aircraft defense with shells or missiles can be contemplated only above altitudes from which radiation on the ground would be very small: more than 2,000 meters for a fusion missile of 1 kiloton.

Given the progress in defense, penetration of aircraft into enemy territory has little chance of success except at very high altitude or, in contrast, by skimming the ground (NOE: nose on the earth) and, more and more, so it seems, at very low altitude.

In consequence, firing neutron weapons can be considered only for maritime defense. Here we again meet the type of use contemplated previously against sea-sea missiles.

At very high altitude the firing mode could also be adopted, but with the distance from the ground allowing utilization of conventional fission nuclear weapons, one can hardly perceive any reasons for using more sophisticated and more expensive missiles. In any event, the age of close bomber formations (bomber boxes) belongs to the past and the only case to be considered among those we have just mentioned is that of anti-aircraft self-defense of ships on the high seas. Further, the defensive missile would have to have great range since the present trend is to equip attack aircraft with "stand off" missiles, that is, of range such that the aircraft can fire them while remaining within the shelter of the conventional anti-aircraft defensive system of ships.

Surface ships, submarines (crews)

On the high seas, on the premise that a nuclear weapon would be used, one can hardly see any reasons for using a neutron weapon against the crews of surface ships, or, at the very least, the portions of such crews the least protected, that is, those whose tasks call upon them to work on deck or in the superstructures providing only little attenuation. It seems simpler, and less expensive, purely and simply to sink the ship by use of a fission weapon....

With submerged submarines, even at periscope depth, the problem does not arise: the several meters of water above the hull provides complete protection against radiation.

As a matter of fact, the only case in which the use of neutron weapons against warships can be contemplated is attack upon a fleet at anchor at such distance from a port city that the use of conventional nuclear

weapons would cause large fallouts upon the population whereas that from neutron weapons would affect only the crews. This would therefore involve ships anchored 2 to 3 kilometers from the coast.

With submarines on the surface the thick hull by itself provides protection of at least equal order to that of a heavy tank. Nevertheless one may well wonder about the effects upon the crew of a neutron weapon equipped with a reflector and exploding at a small distance above a submarine. In this respect, in the case of a missile launching nuclear submarine (SNLE), arriving at, or departing from its base (therefore necessarily sailing on the surface for at least several hundred meters),[22] it would be interesting to study possible effects upon the MSBS (sea-surface ballistic missiles). In fact, the metal doors of their shafts would provide only protection clearly inferior to that obtained from the doors of the silos for SSBS (surface-surface ballistic missiles)--doors consisting of very thick concrete slabs. We do not have the data necessary for such a study. Nevertheless, it is quite obvious that if it shows that there is some danger to the missiles, a portion of the crew could receive a dose putting them out of action immediately. Of course, that would be a matter of explosions at very small distance directly above the submarine. But then, all the more reason to use a low-powered fission weapon which would sink the vessel....

Attack against manned satellites

If it is only a matter of destroying a satellite, manned or not, the use of a super-ABM [anti-ballistic missile] missile fired from the ground or a missile of relatively small weight fired from a specialized fighter satellite should resolve the problem, certainly at a high cost, but without presenting any major technological difficulties.[23] Depending upon the precision expected, the warhead may be nuclear or conventional, although the latter practically requires a direct hit.

Although it borders the domain of science fiction, one may conceive a situation wherein a nation considers that it is of vital interest for it to acquire precise information about an enemy manned satellite. It is then no longer a matter of destroying that satellite but of getting into it in order to study its equipment, or to bring it down to earth for such examination. Therefore, it would be a matter of neutralizing the crew without destroying the equipment, a result attainable with particle beams... if that type of weapon is some day perfected.

In the short term future one can hardly foresee a practical means for this kind of space piracy other than the neutron bomb exploding at a distance such that the attacked satellite's crew is struck by the radiation. The use of a space shuttle as a satellite fighter would allow either the whole prize to be brought down to earth if its size were compatible with the shuttle's docking facilities or else the most interesting of the equipment. Once more it must be said that this scenario smacks of fiction, but without

doubt of political fiction rather than science fiction because the technical resources already exist or belong to the short term future. Of course, there would be involved a very serious violation of international agreements on space law....[24]

Anti-ASM [antisubmarine warfare] defense

The detection, localization, and attack upon submerged submarines from the air relies essentially upon use of sounded buoys launched from aircraft. These buoys are free floating and are used by ASM warfare aircraft. They transmit the data they gather by radio. In the case of helicopters the buoys may be either free floating or tied by cable which provides connection and electric power supply and enables them to be recovered at the end of a mission. Crosschecking the information gathered by several buoys enables the submarine to be localized with a degree of precision dependent upon the conditions of sound transmission in water (depth and temperature conditions).

Sonar may be active : the buoy emits a sound signal which is reflected to it by the submarine's hull. Passive sonar consists of sensing the ship's own noises : engine, propeller, water flow, and so forth.

Arriving in their patrol zones the SNLE move at minimum speed (several knots) compatible with keeping the diving elevators submerged : speed and engine power reduced to the minimum, they are hardly detectable by active sonar.

The typical ASM warfare aircraft used against the SNLE are therefore helicopters associated with active buoys connected by cable. However, this kind of detection has the disadvantage of alerting the submarine which at the present time can find safety only in flight and ejection of decoys. That is a purely passive defense.

But the present technical level makes it possible to design submarine-air missiles (change of milieu) with infrared self-guidance, which would provide the SNLE a means of active defense. It would have to destroy several helicopters rapidly, hence fire several missiles. These helicopters, in turn, could try to protect themselves by ejected infrared decoys and fly at very low altitude in order to complicate the task of the missiles (short turning radius demanding high load factors, with possibility of hitting the water).

Another solution for the SNLE would consist of a defensive missile equipped with a nuclear warhead capable of simultaneously destroying all the pursuit helicopters.

For given power a conventional fission weapon exerts maximum blast effect upon aircraft when their distance (oblique) from the point of explosion is minimal. With these helicopters flying at very low altitude the explosion would also have to be at very low altitude. The optimum result would be

attained by firing at elevation zero, which, it is known, doubles the peak pressure in comparison with an explosion at altitude. But under such circumstances the SNLE runs the risk of being damaged, or even destroyed.

Therefore, another solution would consist of not destroying the helicopters but putting their crews out of action; this, as one did not doubt, by firing a neutron weapon exploding at the standard height of 300 meters. Once again referring to Figure 3[25] we find that, with no protection against radiation, a dose of 500 rads is inflicted at 1,500 meters by 1 kiloton fusion. That is to say that 5,000 rads striking the helicopter crews would be inflicted by 10 kilotons fusion.

The blast effects coming as much from its initiation as from the fusion would be equivalent to those from a fission weapon of 5 kilotons. The explosion altitude being equal to 300 meters, these effects would be nil upon the deeply submerged SNLE.

Of course we have assumed here that the ASM helicopter crews are protected against being blinded by a nuclear explosion (phototropic glasses, and so forth). If such is not the case it is indeed obvious that a small conventional fission explosion would be enough to put them out of action and, presumably, bring about destruction of their aircraft.

(to be continued)

FOOTNOTES

1. It is interesting to observe that, for living beings as well as for electronic systems, susceptibility to the effects of radiation varies with the degree of development brought about by evolution. This susceptibility goes generally, in decreasing order, from mammals to reptiles, then to arachnids, and insects, and so on to bacteria.

   In similar fashion electronic components which employ the latest developments in miniaturization (VSLI": very large scale integration) are more susceptible than those, distinctly simpler, of a few years ago, themselves more sensitive than the earliest semiconductors of the 1950 decade and a fortiori much more so than the conventional vacuum tubes which were the only equipment available 30 years ago. Let us recall, for our younger readers, that up to the invention of artificial semiconductors (in 1948), electronics, radio, and data processing had available only vacuum tubes (thermionic devices: diodes, triodes, and so forth) which required large filament currents. Then the construction of very large computers was a utopian dream: they would have occupied thousands of cubic meters of space and have to be supplied with current by several electric power plants of large capacity; their temperature could not have been maintained at a satisfactory level and, in any event, there would always have been enough tubes out of service for the computer to be in continuous breakdown.

2. See "Technical Data of the Strategic Counter-Forces" in STRATEGIQUE, No 1, pp 95-143.

3. Optical : SMAC (Scene Matching Area Correlator); for radar images Correlatron.

4. In the case of the first attacking warheads, incidentally, one may assume, a priori, relatively powerful aerial explosions (several tens of kilotons) in order to jam defense radars for an appreciable time.

5. See REVUE INTERNATIONALE DE DEFENSE, October 1977.

6. Of course, this is relative. Let us remember that, in a place in space not very near the explosion, for N neutrons coming directly from the point of the explosion about N/10 arrive there distributed in isotropic fashion, that is, in all directions in space. It is a matter of particles diffused by shock upon the nuclei of the nitrogen and oxygen of the atmosphere.

   However, with a well-designed reflector sending the great majority of the neutrons in a fully determined direction the number of them which would be diffused in the remainder of space is small. Light anti-neutron protection would suffice to avoid fratricidal effects upon initiation of succeeding defense missiles.

7. There the air density is half of that at the ground, which results in an atmospheric absorption factor of $\ell^{-R/470}$.

8. One might think that we have just described a sort of mini-Safeguard system. As a matter of fact the differences are very important. Let us remember that the Safeguard system (intended for defense of American strategic missile sites) was derived from the Sentinel, an ambitious project aimed at covering the entire American territory, in particular, the large metropolital areas. The whole comprised :

   --two types of missiles--the Spartan, for attack upon enemy missiles up to distances of 750 kilometers and altitudes of 500 kilometers;--the Sprint, constituting a second line of defense, a missile having very great acceleration in order to intercept, at about 30,000 meters, the warheads which might have escaped the Spartan missiles and distinguished from light decoys by the relative drag in the trajectory within the high atmospheric layers (between 80 and 50 kilometers altitude). That height of interception was justified since it was a question of destroying warheads of very great power (up to several tens of megatons) whose optimum explosion altitude is at about 20 kilometers for action against a city; and
   --two types of radar--the PAR (Perimeter acquisition radar) with electronic sweep capable of detection and tracking up to about 4,000 kilometers;

--the MSR(missile site radar), also with electronic sweep, responsible for tracking, starting at about 400 kilometers, for discriminating targets, and guiding the ABM, [antiballistic missile missiles].

It will be noted that use of the Sentinel system for the Safeguard was only a matter of economy: the defense of a missile site is much different from defense of large agglomerations, but those components were available "on the shelf."

The system which we are here considering, in its radars, does indeed correspond to mini-PAR and mini-MSR but the ABM missile alone is optimized for defense of silos. It may therefore be greatly different--indeed of much lower performance and less expensive--from the Spartan and Sprint. It will also be noted that discrimination of decoys between 80,000 and about 20,000 meters is much easier than between 80,000 and 50,000 meters.

Last, let us recall that it has been said that fitting the Sprint with a neutron warhead was studied.

9. At low altitude the term $\ell^{-R/K}$ which, in the diminution of neutron radiations, represents atmospheric absorption, is equal to $\ell^{-R/235}$ whereas, at 5,500 meters, it is equal to $\ell^{-R/470}$.

10. Fallout is above all else the result of debris from fission. Activities of soil constituents by neutrons contributes only a very small part (NIGA [neutrons induced ground activation] effects).

11. However, in this case, fallout of Pu 239, only a small part of which, as we have seen, is used by the initiation, can be expected.

12. Semiconductors are obtained by the inclusion of "impurities," or doping, selected on the basis of their effects at the level of the outer shell of electrons upon certain zones of a substance itself selected for such characteristics (boron or arsenic doping of silicon, arsenic doping of gallium, and so forth).

    Without going into detail, one may well understand that at the atomic level the impact of radiation acts in the manner of an explosive projectile. The consequences are all the more serious as the number of elementary components per unit of area increases since the dimensions of each become smaller and the connections finer. Now, the present evolution of the technology has made it possible to increase, by a factor of 10, the number of such components per unit of area about every 2 or 3 years for the last 12 years. That is to say that the integrated components, ever smaller and smaller, are also more and more sensitive to radiation. Let us add that one of the substances most widely used for doping is boron, a particularly good neutron adsorber.

13. The impact of the warhead upon the materials may result in the disappearance of the initial radiation but, also, in creation of a particle of another kind: for example, creation of gamma and beta radiation by the incident neutrons.

14. Hardening embraces two different concepts: on the one hand designing devices with maximum resistance of their own to radiation (in this case excessive miniaturization is not always desirable); and, on the other hand, covering them with a shield which absorbs these radiations. In the latter case miniaturization makes matters easier and the optimum solution resides in compromise.

15. For sake of comparison, let us recall that the neutron flux in electrical power generating reactors is on the order of some 10^{15}N/cm^2/second in the core of a thermal neutron reactor and some 10^{15}N/cm^2/second in breeder reactors (rapid neutrons). Very roughly, the result is that the radiation sustained by electronic devices a short distance from the explosion of a neutron weapon may be equivalent to staying in the core of a reactor on the order of several minutes in the case of a slow neutron core and of from several seconds to several tens of seconds in the case of a rapid neutron core.

16. Radar equivalent surface: surface of the diametrical section of a sphere giving the same radar response; here several square decimeters.

17. Manufactured by the Hughes Aircraft Company, this missile arms the U.S. Navy's F-14 Tomcat. After radar acquisition of targets by radar the pilot can decide to fire at ranges, it seems, up to about 160 kilometers. The pilot's role is limited to that decision, the on-board radar thereafter taking over the simultaneous guidance of up to six missiles to their respective targets. In the final phase of its travel the missile is radar self-guided.

18. During the campaign in the Pacific the Japanese troops which held Tarawa (Betio) were able to offer fierce resistance to the American landing despite an advance bombardment of 1 kilogram of projectile per square meter on average. At Kwajalein, on the other hand, with 5 kilograms per square meter (also on average: 15,000 tons over 3 square kilometers) the majority of the Japanese soldiers were killed. The few survivors, who without exception had broken eardrums, offered courageous, but necessarily very limited, resistance.

19. As shown in Part III, STRATEGIQUE No 5.

20. By way of example, from 16 to 18 August 1944, 60 German infantrymen in the ruins of Falaise, for 44 hours, stopped the advance of three excellent Canadian regiments supported by tanks. It is true that here there were young, fanatical SS troops, determined to die on the spot rather than retreat.

21. The living quarters for these sites being located customarily at considerable distance from the silos, and the personnel on duty at the fire-control point being at a considerable depth below ground, the use of neutron weapons would present no danger to such personnel.

22. In general, the SNLE bases are located several kilometers from the ports to which they are attached.

23. In the case of an ABM missile, it would be a missile capable of great range at high altitude. Besides the final stage must be able to modify the ballistic trajectory in order to permit a precise rendezvous. An ABM missile of this type would practically be of the class (size and weight) of an ICBM [intercontinental ballistic missile].

In the case of a fighter satellite let us note that each interception involves:
--an orbit plane changing maneuver;
--overtaking the target satellite by slowing the fighter (falling into a lower orbit its velocity is greater(;
--acceleration in order to reascend to the desired altitude, with reduction of velocity; and
--last, maneuvers for close approach to the target.

These various maneuvers consume a large quantity of fuel so that the number of interceptions therefore can only be very limited for a given satellite if it is not resupplied with "munitions" and fuel, for example by a space shuttle.

As a matter of fact a space shuttle would be an excellent satellite fighter.

Destruction by "death ray" (laser, neutral or charged particle beams) transmitted from the ground hardly seems capable of emerging before the long term future despite appreciable progress in this area. In any event, it cannot fail to involve installations of considerable size. Placed into orbit, that is, used for firing at relatively short range, such a system could be distinctly less powerful but still constitute a satellite of substantial weight (several tens of tons at the minimum). The rendezvous problems would still be present, although the necessary precision can be greatly inferior to that of a fighter satellite armed with missiles.

On the other hand it should be noted that blinding, or even destruction, of the infrared or optical sensors carried by satellites at present seems to be within the realm of possibilities for laser beams transmitted from the ground.

24. See the column "Space Law"; QUE SAIS-JE? No 883,

25. Part III, STRATEGIQUE No 5.

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COUNTRY SECTION INTERNATIONAL AFFAIRS

PRACTICAL DIVERSITY, TACTICAL GOALS OF EUROCOMMUNIST PARTIES

London THE ECONOMIST in English 2 Aug 80 pp 76-77

[Review of book by Keith Middlemas: "Power and the Party: Changing Faces of Communism in Western Europe," Andre Deutsch, 400 pp]

[Text] Take all the domestic, foreign policy and internal party problems that might be faced by a western European communist party. Multiply by four (so as to encompass the French, Spanish, Portuguese and Italian parties). This provides a measure of the complexity that must be dealt with, in Dr Middlemas's view, before a reasoned assessment of the position of the major western European Communist parties can be made.

In this wide-ranging and scholarly study of four communist parties "as they actually exist", Dr Middlemas has decided that it is more helpful to look at the trees rather than the wood. The parties examined are products of very different histories and political environments, and their behaviour, attitudes and structures are more striking for their variety than for what they have in common. "Change in each western party relates more closely to its past than to the continuing phenomenon of international communism." It is as if Maurice Thorez's famous boast that his French Communist party (PCF) was *"un parti pas comme les autres"* now applies to the PCF's *partis frères*, rather than to the bourgeois parliamentary parties to which he originally referred.

"The analysis of Eurocommunism answers few of the great questions about change over the past 10 years." The once fashionable term of Eurocommunism was an attempt to impose order on this unruly variety, and, as such, Dr Middlemas rejects it: "Eurocommunism was a staging post where travellers briefly met, bound for different destinations".

The idea was that western communist leaders were busily developing a new and coherent theoretical response to the problem of how to coexist with western capitalist society, or, more optimistically, how to achieve communist aims while following capitalist rules, and thus not offending anybody. But Eurocommunism was more tactical than theoretical. It just so happened that it suited several parties to dissociate themselves from the Soviet Union (hence "Euro-") and to promise to obey the rules of pluralist democracy. Ideology only entered the fray afterwards, in order to fill a widening gap between the parties' realistic and pragmatic tactics and their vision of a communist society. As Dr Middlemas elegantly puts it, this vision when "painted in Berlinguer's own colours, *en grisaille*, resembles the Cheshire Cat, which slowly vanished away, leaving nothing but the smile".

So, having rejected the false theoretical uniformity of Eurocommunism, Dr Middlemas sets off in search of genuine practical diversity, wading through the four parties' histories since 1968, before emerging reluctantly to make some general observations in two short final chapters. He is almost puritanical in his deter-

mination not to make simplistic generalisations. But he overdoes it, fascinating though the histories are; his rather tortuous style leaves the reader bewildered with detail rather than illuminated by a clear interpretation.

For although the western parties' history, their various characteristics and their strategies may be different, they do share common problems. All are too impotent to achieve their declared goal, and all have to reconcile their basic opposition to the system in which they work with the desire to survive. In the still unstable Portugal, the Portuguese Communist party is "specifying a role in the democratic system", and in post-Franco Spain, the PCE has "completed the first stage of its transition from clandestine existence to being a participant in the normal democratic system". Once in this position, the communist parties have to reconcile the tactics which they practice in order to survive with the need to preserve the ideological cement which binds the parties together and yet maintain their independent identities.

The parties exert a significant influence on the societies in which they operate, both on other parties' behaviour and on government policy. The most curious development has been the emergence of the PCF and the PCI as guarantors of French and Italian stability; both act as safety valves to absorb protest and dissension, while having become too large, bureaucratic and rich to be willing to risk survival and hard-won strength by backing their words with violent action. As for their positive influence on society the large presence of the communists in local government in France and Italy provides a significant lever on policy, as well as proof of their administrative competence.

This involvement in local government is missed out from Dr Middlemas's book. The reader is left with the feeling that, like his previous book, "Politics in Industrial Society", Dr Middlemas has tried to cram too much into too small a space, so that some things have had to be left behind.

CSO: 3120

COUNTRY SECTION FRANCE

NATION'S AIR TRANSPORT POLICY OUTLINED BY LE THEULE

Paris AIR & COSMOS in French 12 Jul 80 pp 36-39

[Text] On 3 July, Mr Joel Le Theule, minister of transport explained French air transport policy before the Higher Commercial Aviation Council. We attempt below to set forth the main statements contained in the text, the importance of which will not escape our readers. The subheads are those of AIR & COSMOS.

An Essential Activity in the Life of the Country

The minister of transport first of all noted that air transport and its related services occupy an essential place in the economic life of our country and in our daily life; they represent 70,000 jobs, 0.5 percent of the GNP, 2.7 billion francs of investment in 1979 and foreign exchange earnings on the order of 3 billion francs. Furthermore, France in 1979 was the third largest international carrier, with 33 billion p/km carried. From 1975 to 1979 the number of air trips taken by the French grew 2.5 times, which corresponds to an increased frequency by certain users, but also, without doubt, a greater use of this form of transportation among the population.

This sector created jobs at the rate of 3 percent between 1974 and 1978.

In his address, Mr Joel Le Theule dealt with three main themes: safety, responsibility of the state in the field of utilization of traffic rights and in satisfying the user.

Safety

After stating that our safety level is good now, although one must still have concern for further progress, especially in the medium-sized companies, the minister showed that progress in this sphere is a function of the competence of the professionals, an efficient organization, and also control by the state. The cost of state surveillance is not negligible. It must therefore be borne little by little by the various sectors involved. Without the regulations being unduly onerous, the penalties must be appropriate. The results of inquiries undertaken following accidents must be made available to all who may profit thereby. The minister asked his services to take steps to ensure that this publicity concerns all of the results of an inquiry into an accident, whatever they may be.

The state also participates in air transport safety by means which it develops. Mentioning the problems of air traffic control, the minister asked operators to cooperate with the air traffic control services to coordinate their plans with traffic needs, to refine them, and to try to execute programs as close as possible to those announced. Studying the means developed by France, Mr Le Theule confirmed that the Reims regional control center will be operational in the course of the winter of 1982/1983. Henceforth part of the personnel which will have to manage it and ensure its operation has been designated. They will follow the construction and installation work so that the operation will reduce the difficulties of any operation of this nature. The effort will not be relaxed in order to improve the performance of the systems and material in service: Cautra IV, air-ground communication links, and telephone networks.

By redefining the role of each person in the air traffic control services, the minister is aiming at a better adaptation of the traffic control specialists to real needs. The draft air navigation budget, retained as a priority budget, is set in current francs at 159 million in operating items, or 28 percent more than in 1980, and 192 million francs in program authorizations, or 34 percent more than in 1980. From 90 in 1980, the creation of jobs will rise to 100 in 1981. Persons employed in civil aviation should rise to 5,696 in 1981.

The International Dimension of French Air Transport

The prerogative of the state, as a public power, to assign traffic rights, is exercised in the framework of fierce competition which takes two forms: on the one hand this competition is expressed within existing agreements. The claims of the young countries which intend to profit from the rights which they do not exercise up to the present time are a matter of concern: they are not abnormal. On the other hand, France is opposed to deregulation, for this policy has aim no other but to permit American companies to regain that part of the international market which they had lost over the years. "We continue to warn our partners of the consequences of such an attitude, to which certain American companies are beginning to ask their government moreover to return. In any case we are concerned indirectly, for if our European neighbors adopt the same position, our traffic will be affected automatically. There would be no question of seeing such a system applied to France, for until proved to the contrary, French law applies on national territory."

The minister stressed that competition went arm in arm with more or less delicate and even unacceptable proceedings: the proliferation of disloyal practices: systematic government subsidies to the companies, secret rebates, refusal of internal routing to passengers using foreign companies, deterrent increase of airport fees, obligation to use auxiliary services at an exorbitant price, blocking the foreign exchange deposits of certain companies. "Our operators must be protected. This may require new thinking about the instruments which we possess."

These instruments are, first of all the Civil Aviation Code, the updating of which is urgent. The minister announced that he intended to put a multi-discipline team to work on this matter. It will have time, because in this field haste is to be avoided. A reasonable deadline for a submission to parliament would be 1983.

Satisfactory Results

The results gained by France in world air transport appear to be satisfactory for the moment. At the present time national transportation is actually in 5th place in the world in total traffic, with 33 billion P/km carried, in second place in regular international goods traffic (2.4 billion t/km carried), Air France is the 3rd largest world carrier in international traffic with 25.3 billion p/km carried in 1979.

From 1958 to 1979 the share of the United States and the United Kingdom has declined, and that of Japan, Germany, and Italy has risen. That of France remained stable. It has 7.5 percent of the freight. A profound change has been confirmed in French traffic. AT the present time French flag carriers carry 45 percent of the passengers on relations links with the European countries, 51 percent on links with Africa, 46 percent on links with the United States, and 50 percent on those with Asia. The rates are generally higher for freight (71 percent for links with the U.S.). With 25.4 million passengers, Paris is one of the great aeronautical crossroads of the world: the 7th platform in the world, and the second platform in Europe after London.

Putting Air Transport in the Treaty of Rome Is Out of the Question

In mentioning the necessity of maintaining and developing our place and examining certain European problems in this spirit, the minister stated: "Intra-European air links may seem inadequately harmonized and burdened by excessively high rates, at least with regard to the better known base tariffs. In my opinion, however, such a statement should not justify certain initiatives aimed at integrating air transport into the competence of the European Community. I consider that in spite of the attempt by the EEC, bringing air transport surreptitiously under the clauses of the Treaty of Rome when it had been expressly excluded when the Treaty was signed, is out of the question. I refer you to Article 84, line 2 of the Treaty of Rome, even if a certain jurisdictional decision has disposed otherwise.

"Both on the European and on the world level bilateralism rules it. In this framework I am opposed to rate experiments and to partial liberalization of capacities. Furthermore I am in agreement with my British colleague. We spoke of the Paris-London link. The problem was also brought up at the ministers' meeting on 24 June in Luxemburg. The government will encourage the initiatives taken by certain airlines in the direction of better adapted rate scales, associated with a simplification of services and cost reduction. In each case, however, we will weigh the consequences for our

carriers. Certain specific experiences may finally be taken into consideration. I am thinking of the inter-regional shipments, for which I hope to get an agreement soon, or the establishment of a specialized rapid transportation network for light freight."

The Situation of Regular International Transportation

Speaking then of the organization and the popularity of French air transport, the Minister first touched on the situation of regular international transportation. He considers that the existence of two carriers: Air France and UTA, is not without interest, for it places at our disposal two instruments which gives us flexibility. Among the strong points resulting from this situation, the minister first listed the comfortable bundle of rights of the companies under discussion: Air France serves 75 countries and 150 stops. UTA covers 38 countries and has 47 stops. UTA and Air France have been able to modernize their fleets. Productivity is improving. The number of t/km [ton/kilometers] per employee for Air France rose from 143,000 in 1975 to 175,000 in 1978, and for UTA from 165,000 to 220,000 in the same period. But the minister stressed that these comparisons must be taken with caution, since the industrial policies and the average distance between stops are different with the two companies.

But this policy also has weak points, especially with regard to the break-even point. Improvements can be made in certain cost items, especially in the field of the short range carrier. The relatively high break-even points of the French companies probably do not permit them to demonstrate great commercial aggressiveness and to offer more attractive rates. This leads them to the setting of a complex rate structure which includes high rates. The absence of a 100-seat aircraft finally represents a serious handicap for the short hop carriers. The total European fleet in existence or ordered and in the pipeline amounts to 198 aircraft, whereas France has not a single one.

For the future the minister first discussed the respective fields of competence of Air France and UTA. The developments over the past 15 years do not mean that we must cry over spilt milk, but it is the duty of the government to see to the maintenance of a division of these international traffic rights, which belong to the nation alone, among the French enterprises. The national company should set itself the goal of offering air transport to the greatest number consistent with financial equilibrium. In this regard, the operating contract signed in 1978 has been a success. Competition is becoming more difficult, however. The company has witnessed a decline in the number of p/km carried during the first four months of the year--even more than the other large European companies. A new contract is under discussion for 1981. It will have to take into account these results. Unlike the previous one, this new contract will be limited to fixing in advance the conditions under which the Concorde network will operate and to determining the amount and the timing of investments. The success of this contract depends on the cooperation of all the interested

parties. If a partner, a shareholder, or a wage earner intends to confiscate the gains achieved for his own benefit, the result would be irremediably compromised. More than ever in these difficult circumstances, it is the hour for coordination, agreement, and solidarity.

International Charter Transport

Speaking then of international charter transportation, the minister described the double attitude of the authorities. As a form of competition of scheduled traffic, this type of transportation constitutes a leavening of competition which the minister does not intend to neglect, without at the same time ignoring its dangers. Mr. Le Theule therefore said that he reserved the right to use it only when the regular companies provide a clearly inadequate transport capacity or none at all, in traffic where our economic or touristic interests justify it. It can also be introduced to reduce the peaks at certain times of the year.

To the extent that it competes with regular air transport, international charter traffic in France is an insufficiently developed activity the fragility of which is explained by a low level national tourist market; the goals are simple: the share of foreign tourists coming to France by air by an increased furnishing of transportation at low price must be increased. To the extent that the French wish to spend their vacations abroad, they should be enabled to use a French flag carrier. In this regard one must emphasize the effort of the regular companies which have put competitive rates into effect (vacation flights).

From there on the policy is clear: Mr Le Theule intends to pursue the open attitude already adopted with regard to short-run charters and to authorize long haul freight flights when they will have fulfilled the following conditions: the reservation will have to have been made in advance, by about three weeks, with a round-trip obligation on the part of each carrier, or it will have to be a forfeit trip of minimal duration with taxes. It is incumbent upon Air Charter International, a subsidiary of Air France and Air Inter, to take the necessary initiatives. If other initiatives are nevertheless presented, the minister will examine them. Released from certain constraints, and endowed with a greater flexibility, they could offer a more attractive service to the user. But the minister stressed that he was speaking of serious initiatives, based on prospects which have been thought through, on a balanced, foresighted management, and not on a desire to fly acquired aircraft outside all consideration and when needed for other uses.

National Air Transport

National air transportation has several peculiarities when compared with international, since it is both more and less protected. More safeguarded to the extent that foreign companies are prohibited from exploiting national traffic but also supported financially by the state, which provisionally assumes the route fees. On the other hand it has to face

directly rail and automotive competition. But only the aircraft is capable of homogenizing space to the point that one could say that all of France is one hour from Paris. Since this position is unique, the user should be protected.

As for the state, it intends to apply two kinds of principles in the matter of competition between modes and between companies.

The first are equally applicable to other modes of transport: to assure to the user freedom of choice among modes of transport and carriers under the best conditions. To establish real and loyal competition among the modes and guarantee to all equal access to the financial market, which is watched over by the specialized committee of the FDES [expansion unknown] no mode should escape the requirements of financial balance. The contract concluded with the SNCF [French National Railroads] has no other object. To permit local collectivities, who are the first concerned, to play a growing role in the processes of decision. A scale of rates as tightly tied as possible to the break-even point constitutes the main instrument for the application of the preceding principles.

The second category of principles more particularly concerns air transport. They derive from the vehicle used. One notes that air transport is unique in that successive generations of aircraft make each other obsolete. From the beginning, the state has had to constitute, 20 years ago, a powerful operator so that it can achieve the necessary effort of equipment and to reserve the financial capacity required for the permanent renewal of the fleets and their expansion with aircraft of improved performance. A monopoly was granted to this operator. As long as this particular type of relationship lasts with the state, Air Inter, the statutes of which do not make it a national company, has accepted and therefore must perform a certain mission. The minister reminded Air Inter that it is of course an enterprise, but that it must always remember its undertakings.

Air Inter, dynamic and efficient, may, nevertheless, when turning its thoughts toward the future, imagine other relationships, or even stress the restraints which are presently imposed upon it. Such rumination is not abnormal. As for the state, the juridical forms and procedures are not the main thing as far as it is concerned. The concern of the authorities is three-fold:

--On high volume regular lines for which Air Inter today operates aircraft of more than 100 seats, in particular the Airbus, the most efficient aircraft of its generation, the user should continue to benefit from progress in productivity. As long as Air Inter fulfills this condition, the concentration of traffic on a single operator, while increasing the flow, is a factor for the reduction of costs: it is therefore beneficial. If on the other hand one day it is no longer fulfilled, conditions would combine for the reopening of a certain competition with the satisfaction of the needs of the user as the sole objective.

--On lines which are served by smaller aircraft but the traffic of which justifies moving up to the Mercure or the Airbus, the monopoly is also necessary, for it is the condition for access to higher performance aircraft.

--On other lines--more numerous--the situation is very diverse and allows for multiple solutions adapted to each particular case. "The principle of one line per carrier must be held to. I have no intention of maintaining the artificial survival of losing lines," said Mr Le Theule.

Regional Transport

Turning then to regional transport, the minister observed that this term covers three types of activity: national lines with little or moderate traffic, subsidiary lines feeding the stops of the large companies, and province links with foreign countries.

The former two constitute an activity very similar to that of the less used lines of Air Inter. The largest line of TAT is moreover large even in comparison with certain lines of Air Inter. There is, nevertheless, one difference: Several companies which operate them (3rd level) are fragile. Others, by contrast, have acquired a solid basis. Wisdom should lead the latter to adapt their ambitions to their means, and the former to take the necessary measures. For this purpose the minister will ask the large companies which through their freight shipments furnish a considerable and necessary support to them to continue on this path by improving, if possible, the conditions of the contracts, in particular their duration.

Turning to the distribution of rights, the minister stressed that the collectivities have a role to play: it is for them to decide whether to open or to continue such lines; it is for them to propose a choice among the candidates presented. For its part the state will undertake the necessary studies, will gather the most informed opinions, above all that of the CSAM [expansion unknown], and will make public these opinions and these studies: not only their conclusions, but also the data which explain, that is to say discourage or encourage such and such an option. Regional transport will be a little like what the collectivities concerned want it to be. The agreement of these collectivities and carriers should almost systematically entail the approval of the authorities, since artificial financial support would not be sought.

Air Inter constitutes a major operator as much because of its traffic as by its fleet, which still requires an effort at renovation. These characteristics as a whole puts Air Inter in a favorable position among comparable European companies, but if one compares the internal company with the U.S. carriers, one can confirm that mostof the American internal companies of comparable size show, for most operating items, levels almost half those of the European levels and that the rates charged are

also notably lower. There exists a margin of progress which must be exploited. The regional companies display a more varied image, TAT being a large company, but Air Alpes and Air Alsace being of more modest dimensions. Certain of these operators suffer from a chronic financial weakness linked, essentially, to financing needs inherent in expansion phases, but also, in the case of some of them, to debatable choices. Some very recent developments may presage an increased cooperation between two carriers which could lead to a strengthening. For its part the state does not intend to intervene directly in the structures of this sector. It will limit itself to guarding against anyone in the profession raising obstacles to the initiatives which are being devised, since they emanate from the interested companies themselves.

Anticipated Developments

Speaking of anticipated developments, the minister said that beyond the increases of capacity necessary to accompany the development of traffic, the most probable development, which the government will not impose, but which it will not systematically oppose, lies in a certain return to a practice of Air Inter: the equalization of rates between lines. Must one go toward truth in prices or toward an equalization of kilometer rates comparable to those practiced, for example, by the railroad? The answer must first of all take account of the user and then of the economic realities. Mr Le Theule noted that the French are not equal in their geographic situation. One cannot see why those of them who are furthest from Paris could not have the advantage of the airplance at the fairest price since the size of traffic flow justifies the use of large aircraft or greater frequency. Indirect assistance, by the detour of rate equalization, to the inhabitants of towns much closer to Paris could not be justified economically or socially, except in particular cases. It is a definite burden on the state budget by the loss in receipts which it causes to the SNCF [French National Railroads]. The minister considers that connections should be progressively operated at their break-even points. His judgment is more modified for transverse connections, even at average distance, for rail branch lines of the existing infrastructure do not always provide satisfactory flexibility in the organization of trips.

The TGV [expansion unknown] constitutes a second fact of the near future. The minister is convinced that airlines concerned will be able to take into account this new fact and take up the challenge which has been thrown down to them. It is probable that they will seek to increase their traffic on longer links or on the transversals. The state, for its part, will see to it that the conditions of competition are fair, but it is obvious that progress is not the privilege of one mode of travel. Aviation, for the first time, faces this truth. "I do not doubt that having analyzed calmly the new structure, it will be able to get the most benefit from it."

Links With the DOM [Overseas Departments]

Speaking of the links of public service with the island departments and territories which are reserved to French flag carriers, the minister noted that the main constraint is to ensure the continuity and year-after-year operation of these links and therefore facing up to the seasonal peaks while maintaining an acceptable quality of service. In addition, it is indispensable to offer the users the lowest rates compatible with the financial equilibrium of the operation. Here cooperation must supplant competition. One must know how to stay within the bounds of logic and not to want the advantages of a system without its inconveniences. The introduction of a flight on demand could be envisaged once the frequency of the regular links were no longer considered an accomplished fact or a definite gain. One must not build an airline operation on subjective considerations, and one must not believe too much in a spontaneous accretion of traffic when the only solid fact of our concerns is the inexorable increase in the price of fuel.

Airports Manage the Existing Investments Better

Examining finally the problems of the airports, Mr Joel Le theule noted that Paris is one of the great platforms of world air transport but that Marseille, Nice, Bordeaux, Lyon and Toulouse, the only French airports to exceed a million passengers a year, are only well below the 20th rank of European airports. The situation of French airports is therefore prosperous without being exceptionally brilliant.

The provincial airports received 17 million passengers in 1979. Since the airport network of France is henceforth a reality, it is not the moment for great investments, but for managing better the existing investments. During a recent congress of consular organizations, some people were worried by the intention of the state to increase its role, or even substitute for the management organizations in some of their responsibilities. This is the opposite of reality. Planned development tends to give the managers autonomy and increased responsibilities. This development is desired and will be expanded. One must progressively entrust to the concessionaire, since he has the competence and the necessary means, certain responsibilities, even in the matter of security, within the framework of the existing regulations (fire and rescue service). The state will of course remain in charge of setting the regulations and norms relating to transportation safety, and it will continue to control air traffic.

The type specifications which will accompany the next concession agreements will be overhauled. It will replace a 1955 text which has become obsolete, it will lighten the guardianship, and will permit a much finer adjustment of the respective responsibilities of the state and of the concessionaire. To live under the protection and guarantee of the state is blind alley. Adaptation is the condition of survival even of the concession system to which we are all attached.

The role of the user through the medium of royalties, just as that of the regional or local collectivities, tends to grow with the need. This assumes a freedom of choice by the managers and therefore the more complete application of the liberalization of royalties provided after 1974 but which meets with certain difficulties in entering the realm of facts. The only limit to this liberalization is the confrontation of the points of view of the companies and the airports within the organs for the purpose. If pursued on a serious basis, that is to say directly connected with the discussion of the directions of management and investment programs, this coordination should usually lead to friendly agreements. For my part, said the minister, I hope it will make the control of the royalties by the state needless.

This policy, affirming a will to leave to the collectivities and to managers certain responsibilities, will it be effective to the extent that the state seems not to renounce at all a well-establish d centralizing tradition since the scheme and plans of aeronautical equipment always exist? In principle, the tendency of the minister is less favorable to this type of document and aims at deconcentrating responsibilities with determination. But the minister still recognizes that the need for space, be it on the ground or in the air, creates such obstacles for airports that it must be useful to possess broadly coordinated documents which make it possible to preserve the quality of the sites likely to be equipped. It is clear that these plans do not constitute a work program. On the contrary, they set limits to the proliferation of the infrastructures.

Remain Realistic

In his conclusion, Mr Joel Le Theule stressed what seems to him to be the condition for long term French air transportation growth. "The regular growth witnessed since the end of the war is perhaps behind us. Air transport is no longer an easy activity. It requires rational organization, tight management, and permanent adaptation. In an international environment where appetites are growing sharp, while demand for air transport stagnates, we must first of all remain realistic: the enterprise and its users must as a matter of priority benefit from the productivity gains which will be achieved. Concern for the future must be permanent. The pursuit of growth and of course the interests of the wage-earners in the coming decade cost this price. Imagination, a sense of the realities, and perspective will are not qualities alien to the French. It is to these qualities, said Mr Le Theule, that I appeal, so that all of you may compete to the satisfaction of the user through a sure means of transport accessible to everyone.

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COUNTRY SECTION FRANCE

OUTLINE OF AEROSPACE MEDICAL RESEARCH CENTER FUNCTIONS

Paris MEDECINE ET ARMEES in French Jun 80 pp 483-487

[Article by Dr R. Angiboust, chief physician of the military services, head of research of the Army and Air Force Health Service]

[Text] The Aerospace Medicine Center for Studies and Research (CERMA) is a specialized research center of the Health Service. It is devoted to fundamental and applied research and to studies in all areas pertaining to aerospace biology and medicine. On the organization diagram, it is attached to the Air Force Officers' Training School of the Health Service. The two organizations are under the authority of a single director; the latter is assisted by an associate director responsible for research who directs CERMA on the scientific and technical plane.

For a very long time groups specialized in aeronautical medicine have existed within the army and air force, oriented either toward selection of military aviators or toward physiological study of man's adaptation to the special conditions of flight. As early as 1917 a Service for Investigation and Physiological Research in Aeronautics was created. About 1920 a laboratory for medicophysiological study of military aeronautics was established at the Val-de-Grace; it functioned until 1939.

At the time of liberation in 1945, the medicophysiological section of the Air Health Service assured coordination of research in aeronautical medicine. Research was carried on in the Central Laboratory of Aeronautical Biology which had just been built within the perimeter of the air force center and in four attached laboratories:

--the laboratory of the Bretigny In-Flight Test Center (CEV);

--the medicophysiological laboratory of the Mont-de-Marsan Military Air Experiment Center [CEAM];

--the Algiers medicophysiological laboratory;

--the Dakar laboratory of tropical aeronautical biology.

Subsequently, the CEV laboratory was detached from the Health Service and attached to the General Commission for Weaponry (DGA). Its personnel has grown and its test methods have developed considerably. It has become the Laboratory of Aerospace Medicine (LAMAS) of the Bretigny CEV.

The Algiers and Dakar laboratories have disappeared. At present CERMA has only two laboratories to carry on its research:

--the Central Laboratory of Aerospace Biology (LCBA), the former CEBA [expansion not known], enlarged and modernized;

--the Laboratory of Medicophysiological Studies (LEMP) of the CEAM, located on Air Base 118, at Mont-de-Marsan, also enlarged since its creation.

One may be astonished at the existence of three military laboratories dealing with aeronautical medicine. However, each of these three laboratories has its own proper area of specialization.

The Central Laboratory generally is entrusted with research necessitating rather fundamental investigations to answer very general questions which engineers may have when designing aircraft. Its equipment allows it to conduct investigations both for men on the functional plane and for animals on the biochemical and cellular plane.

LAMAS intervenes, like CEV, at the prototype level. It specializes in tests of protective equipment, in tests of resistance to environmental stresses (accelerations, vibrations, cold, heat, altitude) and in the development of life-saving devices.

LEMP, within the framework of the Military Air Experiment Center, is occupied more particularly with working conditions of military aeronautics personnel: the study of stresses during air missions, design of alarm systems, methods of use of the equipment for survival, safety and life saving.

Research projects entrusted by CERMA to its two laboratories (LCBA and LEMP) are all integrated in the multiannual program of study and research of the Ministry of Defense and are carried out under directives by the Central Directorate of the Army and Air Force Health Service. They are ordered along the axis of priorities which were defined by the air force at the time this program was worked out.

Besides these very formal, somewhat unwieldy relationships, operational necessities require that CERMA have more direct relations with the services of the air force general staff and the General Commission for Weaponry charged with conceiving or following the development of aeronautical programs. CERMA's various specialists are called on very frequently as consultants or advisers by these organizations or even by organizations belonging to other armies or to the civilian sector, when the latter do

not have at their disposal specialists capable of answering the questions which face them. Moreover, the CERMA laboratories receive orders from the Directorate of Research, Studies and Techniques (an organism of the DGA) when the latter does not find in the civilian sector laboratories having the required specialization to carry out research for which it has responsibility.

Thus, the work of the research center is many-sided and varied. Aeronautical technique evolves fast and changes. It is often necessary to respond rapidly to urgent questions. Other questions must be investigated more thoroughly and require rather fundamental research which may be spread over several years. The majority of the center's research workers are physiologists, but it also makes use of the competences of other specialists: chemists, biophysicists, anatomopathologists, electronics specialists, experimental psychologists, veterinarians; the very practical questions which are posed must almost always be dealt with by several specialists. /The organization of the laboratories/ [in italics] takes into account the technical necessities imposed by the direction of research at the moment.

The Central Laboratory of Aerospace Biology includes six research divisions:

--metabolic and hormonal physiology,

--psychophysiology of visual perception,

--acoustical and biomechanical physiology,

--applied neurophysiology,

--aeronautical histopathology,

--biochemistry and toxicology.

The divisions are backed up by a calculation service and an electronic measurement-instrumentation service. The chief physician of the LCBA has under his responsibility a bureau for study of air accidents, whose role is to centralize and investigate all the files of air accidents occurring in the air force to determine the role of the human factor in the occurrence or aggravation of these accidents and to propose to the general staff any measures which can improve flight safety.

The Laboratory of Medicophysiological Studies at Mont-de-Marsan has three sections:

--the section of research and applied physiology,

--the section charged with aeromedical instruction of air crews,

--the physics and chemistry section.

The divisions of each laboratory are placed under the authority of a research specialist of the Health Service (doctor, pharmacist or veterinarian). The chief physicians of the laboratories are research masters or faculty professors.

Work orders are distributed among the various services of the laboratories according to the competences of specialists to answer the questions raised, and the testing equipment which these services have. In fact, military aeronautical personnel use advanced technologies under exceptional environmental conditions and under stress factors which are often at the limits of human possibilities. These problems posed by adaptation of the military aviator to his environment and his work involve very comprehensive means of investigation and often very expensive testing equipment: reduced pressure caissons, centrifuges, controlled environment chambers, vibrating buckets, acoustical laboratories, etc. Some problems cannot be approached by laboratory simulations, and require studies in flight involving the use of means of recording, transmission and treatment of biological information and produced so as to allow them to function on board airplanes. The problem of costs is a major concern for the officials responsible for research.

The work entrusted to CERMA over the past few years is grouped according to five directions of effort.

Ergonomic Problems Posed by Future Airships

The generation of armed aircraft starting with the Mirage 2000 represents a new level in the evolution of aeronautical technology. Electric flight guidance, and integrated presentation on cathode screens of piloting and navigation information, are new techniques which should theoretically facilitate the pilot's task and lessen his work load. But the great maneuverability of the aircraft, attained through electric guidance, risks exposing the crew to levels of acceleration never encountered in present aircraft. It must be determined by studies in flight exactly where this matter stands, and the risks incurred by crews in the short and the long terms must be evaluated. Laboratory experiments on monkeys centrifuged in a repetitive fashion will allow determination of these risks.

Presentation of information on a cathode screen, an aid to night vision on helicopters, has led to posing fundamental problems of psychophysiology of vision, which it has been necessary to restudy on the very special visual supports which are the cathode screens. The fundamental data are lacking just where most needed to obtain a rational basis for the recommendations which must be made to the engineers. In the absence of these data, the best way to proceed is to advance empirically step by step, together with engineers and users. It is necessary for the proposed new modes of presentation to be accepted by the users and for these methods

actually to facilitate their task. It is especially necessary for these devices not to be the source of new environmental stresses which can in some cases compromise safety.

Problems Linked to Flight Safety

Safety is not only the business of the bureau of air accidents. Other services are directly concerned with these safety problems. Chemists and anatomopathologists are engaged in a multidisciplinary study of airplane fires. In air accidents, the passengers are killed or simply incapacitated by the fumes and toxic emanations coming from combustion of the constituents of aircraft cabins. We need to understand what happens in these fires in order to propose means which will enable the passengers to survive.

Another problem of chemistry concerning safety: for obvious operational reasons, the air force is forced to manufacture itself the liquid oxygen destined to be breathed by pilots. This oxygen must meet very strict standards of purity. The chemistry laboratory of the LEMP has developed techniques allowing detection of impurities and humidity at very low levels, on the order of a few parts per million.

Use at the LCBA of a mass spectrometer having one of the highest performances of any existing in France allows detection in the blood of accident victims of any absorption of medicinal products or social drugs.

For 10 years a major effort has been under way to give student pilots basic training in aeronautical medicine. They are systematically given demonstrations in the LEMP reduced-pressure caisson to let them experience for themselves the consequences of a breakdown in the oxygen circuits and to allow them to appreciate objectively the deterioration of performance caused by hypoxia. In the same way, disturbances of perception currently encountered in some aeronautical situations, in the absence of visual references, are demonstrated to them.

Ergonomic Study of the Defense Systems of Air Bases

These systems associate a radar detection unit with a missile firing unit. The operators' task is complex. They are under considerable stress to complete operations on time. Training the operators on a scale of actual operation is practically impossible. A simulator was designed which permits at the same time initial training of the operators and an ergonomic analysis of the task to bring to light the nature of their difficulties and to propose solutions for them.

Evaluation of the Physiological Cost of Environmental Stresses

Here we are speaking of an almost permanent task of the laboratory. Formerly hypoxia, hyperoxia, and hypocapnia were the object of very advanced studies. Today the orientation is toward the study of environmental stresses more

characteristic of modern aeronautics: noise, vibrations, electromagnetic radiations and especially radar radiation. The means of investigation and methods of analysis have been perfected. Hormonal and metabolic reactions are now being studied especially. Exploration of the central nervous system has also become very advanced, associating the electrophysiological approach and the behavioral approach. A well-equipped monkey house supplies "experimental subjects," which are daily exposed to stresses of various types.

Fatigue is a traditional theme for army physiologists. Evaluation of the state of physical training of personnel is a concern of command. Modern methods of quantification of energy effort expended allow us to envisage valuable means to measure it in a simple way through tests which can be used on land. Certain results obtained from hormonal explorations carried out on athletes during sustained effort give us cause to think that it will perhaps be possible at last to delay the appearance of fatigue by nonaggressive therapeutics.

Study of the Biological Effects of the Space Environment

Since 1961, CERMA has enlarged its activities in the domain of space. Ballistic flights of small animals in the Veronique and Vesta rockets had already allowed us to outline the bases of a methodology of analysis of the physiological effects of the space environment.

This space activity carried on with the support of the National Center for Space Studies, after an eclipse of about 10 years, has been resumed with the hope of seeing France participate within the European frame in the flights of the European space laboratory put in orbit by the American space shuttle.

Several projects for experiments have been conceived by the CERMA research workers to be embarked upon in the laboratory. The most advanced is an experimental module allowing two monkeys to fly carrying physiological instrumentation implanted for a longer period. This project proposes to offer the European scientific community an instrument which can be used to analyze the effect of remaining at zero gravity on the major physiological functions. In fact, while the various manned flights which have occurred over the past 20 years have shown that man can live in space for periods of up to 3 months, they have also shown that physiological adaptation to conditions of weightlessness was not accomplished without difficulties, sometimes major ones, especially in the areas of equilibration and circulation. It appears necessary to analyze these phenomena of adaptation with animals in order to propose rational solutions there also. The two-primate module project is not, moreover, reserved for space. A laboratory version will offer researchers an experimental tool for analyzing the physiological effects of stress factors. It will be used very soon to study the effects of high-level accelerations on the organism.

The concerns of space medicine are the same as those of aeronautical medicine. This has been seen, for example, in the area of radiobiology, the second major field of space medicine. The techniques used to study the biological effects of cosmic radiation are the same as those put to use to study the problems of radioactivity at the time of tests on the Concorde. For the physiologist, there are no boundaries between space medicine and aeronautical medicine.

A program of such diversity and such intensiveness can only be envisaged with the support of very solid documentary sources. Thanks to its participation in the automated documentation system of the Weapons Documentation Center, the documentation service of CERMA has almost instantaneous access, on its terminal, to the best American documentary sources: aerospace collection and governmental reports of the National Technical Information Service of Washington (NTIS), Compendex file (engineering sciences), National Library of Medicine of Bethesda (through the intermediary of the Medline system).

The translation service makes periodic analyses of the reviews of aerospace medicine in foreign languages (English and Russian); a library oriented specifically toward aerospace medicine and biology allows research workers to consult specialized works and periodicals.

Aside from official research reports, to make their work known the researchers have at the national level the Society for Aeronautical and Cosmonautical Physiology and Medicine, which publishes their works in its review LA MEDECINE AERONAUTIQUE ET SPATIALE. On the international level, very fruitful meetings take place with foreign researchers twice a year, at meetings of the aerospace medicine group of AGARD [expansion not known], consultative organization at the heart of which are gathered the specialists from NATO countries. But financial considerations often limit the participation of French military researchers.

The same financial constraints limit exchanges of researchers and direct contacts with foreign laboratories. This is somewhat regrettable because they often allow more rapid advancement in research, and thus increase the efficiency and yield of the research center.

5586
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COUNTRY SECTION FRANCE

MISSION, FUNCTIONS OF SUPPLY GROUP REVIEWED

Paris ARMEES D'AUJOURD'HUI in French May 80 pp 44-45, 49

[Article by Col Bernard Michel-Levy]

[Transportation Colonel Bernard Michel-Levy served in Indochina from 1952 to 1954, where he took part in the infantry in the battles of Na-San and Dien Bien Phu. An instructor at the ESMIA [Ecole Speciale Militaire Inter-Armees at Saint-Maixent] from 1957 to 1959, he served from 1960 to 1962 in the 519th Transportation Marching Battalion in Algeria. He then carried out the duties of Employment Office Executive Manager in the Transportation Command of the 6th Military Region (RM). Commanding Officer of the 511th Transportation Group from 1969 to 1971, then of the 84th support regiment from 1975 to 1976, he was appointed Transportation Commander of the 8th Division in 1977. Adjutant to the general commanding transportation of the 1st Army Corps [AC] of the 6th RM since 1979, he is the commander designate of the supply chain of the logistics brigade on the 1st AC.]

[Text] The massive arrival in the army corps rear zone of truck or railroad convoys marks the culmination of an important step in the forwarding or some 6,000 tons of the various provisions required for the overall daily support of combat operations.

Within the logistics brigade, the SUPPLY CHAIN then takes over the difficult steps of a new and not less essential stage of which each one of the divisions and each one of the formations belonging to the Army Corps Organic Elements (EOCA) constitute by the nature and volume of their needs the multiple and diverse objectives.

In spirit, this mission is immutable. It always involves forwarding, towards units in battle, according to the rhythm of their consumption and need, fuel, all sorts of munitions, mines, rations, clothing and ordnance for organizing the terrain. But, profiting from the rich logistics experience acquired during the last decade, the supply chain has been conceived, eschewing the pitfalls of the past, to effectively adapt itself to the new structures of our forces and to the mobility of their manoeuvres.

A Simple Organization and Potent Means

In spite of their diversity, all the means of the chain, whether they belong to transportation, equipment, gasoline service or the quartermaster corps, are consolidated under the orders of a single head in a functional organization whose flexibility derives, in large measure, from a clear separation in the execution of major functions.

RECEIVING supplies coming from the infrastructure is the prerogative of a relatively static rear echelon, while satisfying the units' needs rests within the purview of an infinitely more mobile forward echelon which has two clearly differentiated functions: DELIVERY, intended for the division, DISTRIBUTION, for the EOCA.

From this specialization there naturally derive an efficient decentralization of responsibility and possibilities of manoeuvre which are increased by the relative independence of each of the important pawns.

The means of execution represent the impressive aggregate of nearly 6,700 men and 2,400 vehicles, which belong to 13 different formations: 3 transport regiments, 2 munitions groups, 2 semi-public gasoline companies, 6 quartermaster units with different functions (supply, specialized transport and bread baking).

Among the typical ordnance with which they are equipped figure over 600 two-way couplings--tactical trucks with trailer--of an overall capacity of 7.5 tons, a complete range of fuel cisterns of 5, 20 and 30 cubic meters with road or cross-country specifications--to which it is appropriate to add the fuel storage capacity in flexible tanks exceeding 3,000 cubic meters--and an entire gamut of storehouse means composed of lift trucks, cranes and hydraulic storage jibs.

The whole of these formations is articulated in 3 functional groupings, the rear supply grouping (GRAR), the army corps organic elements supply grouping (GREOCA), the forward supply grouping (GRAV), each built around a transportation regiment whose commanding officer is in charge of the grouping.

Although their missions are fundamentally different, the internal organization of the 3 groupings is laid out in the same spirit. They comprise on the one hand a certain number of functional cells with various ramifications which constitute command and organization structures adapted to the multiple aspects of the mission. They are the chain's framework, its base points, between which the incessant circulation of the supply flow is organized. The means of transport, rapidly distributed along the entire chain, represent on the one hand the moving stock which, free from any basic care of belonging and practically speaking deprived of the direct aid of a staff used elsewhere in organization tasks, irrigates the entire system in a noria which ebbs and flows, a system perpetually regulated in volume and distribution according to reported needs and clearly defined priorities.

Without going into detail, the articulation of means available is expressed for GRAV by the existence of FOUR WHEELED SUPPLY ZONES (ZRR) each geared to satisfying the needs of one or even two divisions for emergency, short-lived periods of time.

GREOCA has set up FOUR DISTRIBUTION CENTERS (CD), by which EOCA units are served according to their geographic location, irrespective of which branch of service they belong to.

Entrusted with the most complex mission and falling heir, in addition to the transport regiment, to the essential elements of the formations of the other branches or services, GRAR is subdivided into two identical entities each one of which comprises ONE TRANSHIPMENT ZONE, ONE TRANSIT AND EMPTIES ZONES, and THREE TECHNICAL ZONES with specialized activities in fuel, munitions, or ordnance.

Functioning Based on Specialization and Initiative

Already outlined in its principles, the chain's functioning can be summarized briefly, insofar as the details of an execution, where each participant, no matter how small, assumes a large degree of initiative and responsibility, is passed over in silence.

GRAR, the rear echelon of the supply chain, is also its pivot. GRAR is where the supply flow from the infrastructure is unloaded and forwarded, by the army corps' means, on a first spurt, towards the combat formations.

Within each transhipment zone, specialized yards organized around stations for railroad convoys or receiving areas for truck convoys take delivery of supplies and transfer them to the brigade's means of transport stationed by the transit and empties zone. It is towards the latter that the greater number of homogenously loaded rigs or fuel cisterns capable of being sent as is towards the front make their way. The technical zones receive the rest to carry out the complementary operations of sorting, breaking down, packaging or temporary storage, involving numerous types of munitions, foodstuffs, or fuels.

The general collection agent of "empties" on their way to transhipment yards, the transit and empties zone performs the same function for "loaded" rigs on their return, heading towards the front. It has for this purpose two types of corresponding entities: supply, or wheels zones or distribution centers. Specific instructions from the chain Command Post (PC) adapted by the GRAR PC make it possible for it to cadence, select and direct its deliveries.

Near the divisions' rear echelon, GRAV sets up its wheeled supply zones which are regularly supplied by GRAR. As a general rule according to the requirements and the situation of the moment, the ZRR deliver to division bases the supplies intended to replenish those consumed. However, when

circumstances require, the system is partially or totally reversed. The division empty vehicles return to the ZRR where all required means are present so that an anticipated reloading can be carried out under optimum conditions.

GREOCA's task is more complicated. Its function of "retailer" serving numerous individual recipients requires, of distribution centers, a more elaborate organization. Their load may comprise a volume of 15 to 20 miscellaneous subscribers because in addition to EOCA formations, all logistic brigade units resupply themselves there in veritable supermarket structures capable of meeting the demands of large artillerymen customers as well as small Health Service consumers.

With respect to certain preferential subscribers such as the army corps reconnaissance grouping or combat helicopter regiments, GREOCA's program can evolve from distribution to delivery by forwarding directly towards the interested parties' zones or support terrain their essential needs.

A Certain Cohesion of Command Means

Described thus in its principal workings, the functioning of the chain calls for several clarifications in its command organization.

The chain's PC is integrated with the logistic brigade's under the same conditions as with the HEALTH and CONDITIONING CHAINS. It comprises a special general staff with two principal cells, one in charge of the management of, the other in charge of keeping track of, all needs, levels and transportation.

At the head of the groupings, the transportation regiment commanding officers adapt their own general staff to their new mission.

With the exception of GRAR technical zones their squadron commanders sponsor the chief works of groupings such as CD, ZRR, or various zones within which the platoon leaders assume command of the different subordinate functional cells.

In spite of an efficient set up, linked to the mobilization and assembling of the army corps in its zone of initial deployment, the cohesion of the whole is thus assured from the start by natural hierarchical bonds all the more solid in that the designated commander of the supply chain--the adjutant colonel of the army corps transportation commander--follows already in peacetime the education and training of transportation regiments and their mobilization.

In The Service of a Manoeuvre Linked to the Needs of the Front

It is indispensable, on terminating this succinct presentation, to bring up the fundamental notions concerning the chain's deployment and possibility of manoeuvre.

Its units are spread over the entire army corps rear zone. Between the rear echelon where GRAR reigns and the forward echelon, the domain of GRAV and GREOCA whose elements are tightly meshed, distances must remain such that they make possible at least a daily rotation of means of transport. Beyond that, there lies the risk of not being able to completely compensate for current consumption.

The placing of ZRR and CD near division bases or combat trains of subscriber formations involves a certain stretching of the umbilical cord which joins suppliers and customers, but this pliancy quickly reachs its limits in combat mobility.

Thus depending in its action on the nature, tempo and amplitude of the tactical manoeuvre the supply chain must perpetually harmonize the imperative necessity of maintaining its forward echelon in the wake of the operational disposition, without for all that compromising supply continuity by an excessive instability of its formation. The flexibility of its organization generally makes this possible by dint of excellent adaptation capacities.

The interdependence of all these cells does not in reality exclude their autonomy. This is translated specifically for each of the forward echelon elements by the possibility of manoeuvring in isolation according to the tempo of the movements of its own subscribers and with no major interruption of the logistics flow which concerns it.

The efficiency of the entire set up is above all insured by the good stability of the rear echelon whose manoeuvre does not necessarily copy that of the forward echelon. A judicious choice of initial deployment is sufficient--except in exceptional situations--to maintain the stretching within tolerable limits for significant periods of time.

It is moreover admitted that it is always advisable, at all levels, to accept the temporary increase of the logistic distance covered rather than to multiply movements. The substantial initial self-sufficiency of the combat formations brings to bear on these ticklish choices an additional factor of flexibility.

The impression of ease this brief outline may possibly give rise to cannot hide from anyone, and least of all from the tactician, the constraints and importance of harsh reality.

It nonetheless remains that the numerous exercizes and manoeuvres carried out over a 3-year period have demonstrated that a reliable system was in place. The supply chain is capable of fulfilling its missions. The projected amelioration of its transport potential by the delivery of more powerful and more modern means should make it possible for it to enlarge still more its possibilities of manoeuvre, or more exactly to "stretch" them for greater liberty in support range and better adaptation to combat mobility.

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COUNTRY SECTION FRANCE

LOGISTICS BRIGADE REPAIR, MAINTENANCE UNITS VIEWED

Paris ARMEES D'AUJOURD'HUI in French May 80 pp 52-53

[Article by Maj Michel Couilloud]

[Entering Saint-Cyr in 1961, Major Michel Couilloud (BTEMS) began his career in the signal corps and has served in the ordnance corps since 1971. After spending 4 years as instructor in ordnance captains' courses, he took command in September 1976 of the 103rd Army Corps Equipment Repair Group stationed in Mulhouse.]

[Text] "When logistics says 'no' it is right, the plan of operations must be changed, it is wrong." General Eisenhower.

Created in 1977 during the reorganization of the army, the Army Corps Equipment Repair Groups (GRMCA) are the heirs of the reinforced logistics repair companies. They are, however, considerably different for several reasons:

--these units constitute a corps;

--the manpower strength is already much greater;

--the number of units and equipment to be supported has increased.

If the changes mentioned have only slight effect on the activities of logistics specialists, they make themselves felt with greater difficulty in employment principles because of larger zones of action and the variety of types of support.

The 3 GRMCA's of each army corps are, in wartime, directly under the orders of the colonel, head of the maintenance chain of the logistics brigade. Two identical GRMCA's are deployed towards the front and the third towards the rear for the support of logistics units.

The GRMCA takes part in the execution of the missions of the ordnance branch in operation. In this case, it assures the direct support of

ordnance in 10 regiments belonging to the Army Corps Organic Elements (EOCA). It also supports certain special equipment of one or several divisions.

The GRMCA commander responsible for the specific activation of his unit has available to carry out the mission of keeping equipment in condition the following means:

--MEANS OF HIGHER COMMAND: these are the traditional groups of every higher command section necessitated by life in a campaign (signals, mess, administration, munitions, fuel, post office), but also the technical employment group which makes possible the technical coordination of the elementary foot soldiers.

--MEANS OF SUPPLY: in the 'supply detachment' three store groups and one liaison and store-keeping group are integrated: the latter group make it possible to fill orders, to know the where-abouts of requested replacements, to distribute them but also to resupply itself towards the rear.

--MEANS OF AUTO, MISSILE, TANK, HEAVY CALIBRE WEAPONRY AND TURRET REPAIR: there are 8 mobile repair sections which, working alone or grouped by 2's or 3's are characterized by their MOBILITY and VERSATILITY; moreover, a contaminated zone intervention group makes it possible to sort and treat contaminated equipment, thus giving an added dimension to GRMCA repair potential.

--OTHER MEANS OF REPAIR: included in a weapons telecommunications detachment, a certain number of specialists work in well-equipped truck workshops, assure support in such varied branches as: small calibre weaponry, fire control, optronics, special weapons, radio, teletype, wireless beams and radar.

A ROLAND detachment makes it possible in addition to repair all the equipment of the surface-to-air type ROLAND regiments.

--MEANS OF RETRIEVAL: 2 tank transporters make possible the retrieval of sensitive or priority equipment.

All total, the forward GRMCA is made up of 180 varied and heterogenous vehicles used by about 400 service personnel in the ordnance branch.

Employed on the terrain, the repair group must guarantee the potential of the regiments it supports. Its action is different in the preengagement period from its action in the engagement period.

Before the engagement, the maintenance of the formations at their highest level of combat potential is obtained by the continuity of the mission in peacetime, with however increased availability: for that purpose the GRMCA, extensively assisted by the infrastructure, brings condition maintenance support as close as possible to the different zones of deployment and if

necessary on the routes during army corps movements. During this phase the GRMCA can carry out about 80 interventions a day, which corresponds to about one day's supplies.

SOME FIGURES...

-- 68 AEB teams

-- 21 various specialty teams

-- 36 trucks and tractors loaded with various replacements (100 tons)

During the engagement, the GRMCA's action is limited at that time to overhauling equipment capable of taking up its place once again in the disposition before the end of the engagement and to distributing replacements; the support is more selective and concerns particularly equipment chosen according to tactical and technical priorities defined in army corps and logistics brigade orders. The overall intervention capabilities are considerably lessened in consideration of more frequent movements and periods of time required for setting up shop. In order to obtain a certain degree of efficiency, a stable period of from 8 to 10 hours is sought in spite of the dynamic action of the Army Corps.

During the engagement, the GRMCA, characterized by its mobility and the flexible use of its means, works primarily in dispersed order.

This dispersion is made obligatory by the different methods of support linked to the doctrine of the employment of the repair groups.

One must distinguish between:

--the detachment (section or group) adapted to a regiment or grouping of forces (a restrictive notion in space-time framework);

--the detachment (section or group) working in zonal support, that is to say on behalf of all the units stationed in or transiting a certain zone (a night-watch frequency makes it possible to enter into liaison with the GRMCA and thus request technical interventions).

These possibilities are found conjointly in all the tactical situations in which the GRMCA is employed. They contribute however to a great deal of dispersion which brings about some liaison and command difficulties, which are partially resolved by radio integration and by contingent material reinforcement furnished by the logistics brigade. In addition, the aforementioned dispersion requires solid knowledge in critical areas such as topography, the movement of isolated vehicles, signals security, radio integration, camouflage.

Carried out in peacetime on behalf of active and reserve personnel, this instruction is facilitated by the use of the process of all-inclusive missions which furnishes more emulation and continuity in these training actions.

The EOCA conflict and support units assure the army corps strength and mobility; the GRMCA's, by the means they employ, constitute a large portion of army corps logistics, making it possible for crews to fight and for material to remain in service.

[Inserted table from p 53 of article:

Some 3 Echelon intervention durations in Hours				
(Crews of 2 or 3 Operators)	AMX 30	GBC	Sumb	Jeep
Engine	8	12	12	8
Block or transmission	8	8	10	7
Clutch	4	10	15	9
Front Axle	-	5	6	3

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COUNTRY SECTION FRANCE

BRIEFS

CHANGE AT SDECE--Alexandre de Marenches will probably retire as director of the SDECE early next year. The names of two possible successors are now making the rounds: Pierre Pascal, a member of the staff of Jacques Chaban-Delmas, whose offices are in the Hotel de Lassay; and Paul Masson, currently a prefect and former office head under Michel Debre and Yvon Bourges. [Text] [Paris VALEURS ACTUELLES in French 11 Aug 80 p 9]

CSO: 3100

COUNTRY SECTION ITALY

DALLA CHIESA TESTIFIES BEFORE MORO ANTI-TERRORIST COMMISSION

Report on Testimony

Milan CORRIERE DELLA SERA in Italian 12 Jul 80 p 5

[Article by Sandro Acciari]

[Text] In 10 solid hours of testimony the general spoke frankly about the subversion syndrome. Dalla Chiesa told the Moro Commission: "At least seven terrorists have confessed and given evidence." On arrest, Peci asked to be questioned by the Carabiniere general in person. The "Grande Vecchio" (BR founding fathers), according to the Carabiniere commandant, is made up of the founding core of the Red Brigades, still active inside the super-prisons. Commission also hears Carabiniere Commandant Cappuzzo.

Rome--He talked without interruption for almost 10 hours, from 1630 hours on Tuesday afternoon until 0330 next morning. He read from no written reports: every word was off the cuff, save when he would pause to glance at documents to make sure of names and dates. For the first time since he was tapped to head the war on terrorism, Gen Carlo Alberto Dalla Chiesa told "outsiders" about this analysis of the situation, his record over 2 years of investigation, and what he sees ahead.

For the first time since it began hearings, the parliamentary commission set up to look into the Moro kidnap-murder had a chance to hear at first hand the way things stood. "He gave us a complete and up-to-date X-ray of the Red Brigades and of all other armed organizations," said one of the 20 members.

Dalla Chiesa told all, frankly answering the dozens of questions, not even holding back when the commission wanted to know whether or not at any time, in the heat of the battle

against terrorism, he might have stepped outside the limits of the law. From Peci to Micalettò, from Mario Moretti to Renato Curcio, from the situation in the prisons to the "Grande Vecchio" and on to the international links: the general's report to the Moro commission left out not a single detail.

The Peci Case

This one is still a feather in the cap of the special carabiniere unit, the operation that touched off a long string of arrests. Dalla Chiesa did not deny that he was lucky on this one. He told how Patrizio Peci, leader of the Turin Red Brigade column, had managed to slip away after weeks of shadowing. One evening he ducked into an apartment building: a few minutes later a light went on. The carabinieri waited outside until the next morning, and when they knocked down the door of the apartment there was nobody there. A few days later Peci, by sheer luck, literally ran straight into the arms of a patrol crossing a piazza in Turin. In a few minutes, the young man was taken away, while Dalla Chiesa's men stayed behind to wait for the person with whom the Brigade leader presumably had an appointment. And that's how Rocco Micaletto wound up with handcuffs on before he had time to think.

Peci's 'Contrition'

On this count again the commissioners' questions came thick and fast. The commandant of the Pastrengo division stated that he had been informed at once that Patrizio Peci was showing some inclination to collaborate, but on one condition: that he, Dalla Chiesa, should personally conduct the interrogation. A military ceremony, if you will, one leader "surrendering" to another, as the officer explained.

One more inevitable question: what had he promised the Red Brigade chief? Answer: Nothing, except for the obvious fact that cooperation would make him eligible for the advantages written into the anti-terrorist laws.

How Many Are Talking?

Patrizio Peci is not the only one, and we all knew it. General Dalla Chiesa named no names, but cited numbers to show the extent of capitulations: at Peci's level, seven top terrorists from armed groups have agreed to tell all. Dozens of "small fry," though, who gave vital information, were crucial in finding out who was who and which individuals were responsible for what.

The 'Grande Vecchio'

This is another standard question, and has been ever since the parliamentary commission was set up. The carabiniere chief set

out his theory: the Grande Vecchio, he said, the brains of the organization is the founding core of the BRs. Curcio, Franceschini, Ferrari, Ognibene, and the rest are still playing a primary role, not only in strictly ideological matters, but in day-to-day operations as well. Flowing out of the superprisons, Dalla Chiesa asserts, are streams of theoretical guidelines and practical directives. The general would not rule out the possibility that some of the brains with equal clout and equal prestige might still be at large.

The Great Veterans of the BRs, though are still these same men. Mario Moretti, the most notorious of the fugitives, is merely extremely skilled at carrying out orders.

The 'Moles'

Columns, firing groups, the various "fronts," and strategic leadership: all were explained in minute detail to provide a clear table of organization for the various armed units of the Red Brigades and Front Line. Gen Dalla Chiesa purposely emphasized the perilous nature of the work done by the "moles." Terrorist organization infiltrators have burrowed into practically every strategic nerve center of the state apparatus. Dalla Chiesa even voiced some of his suspicions, citing the ministries of justice, transport, and education. He also mentioned the Paris-based cultural center known as Hyperion, which several quarters have fingered as the BRs' strategic base. The general did rule out, however, at least on the basis of evidence thus far in hand, the likelihood that there are any permanent or built-in international connections.

The Prisons

This was a topic the witness kept coming back to again and again. There was a critical reference to the recent murders in the maximum security prisons. Della Chiesa cited an example: in the brand-new Palmi super-prison, he said, mafiosi and "politicals," who are supposed to be rigidly segregated, are actually part of a joint commission to "monitor" prison food!

'Political' Analysis

There was yet another key Dalla Chiesa sounded constantly. Study of the documents passed out by the terrorists makes it possible to get a grasp on what is going on behind the wall of secrecy and to gain important clues as to impending moves. One case in point: according to the general, it would have been possible to predict a coup of the scope of the Moro case through careful reading of the 1977 "Resolution of the Strategic Leadership."

In the same way, it became possible to understand the "logic" behind apparently similar murders which were in fact the result of quite distinct and specific motivations.

Many of the matters dealt with last Tuesday were brought up anew yesterday during the hearing for Commanding General of Carabinieri Cappuzzo, which began last February. "A major contribution," was the comment from Senator Lapenta, who is vice president of the commission. Cappuzzo admitted that in specific periods agents from the counterintelligence service (SISMI) had been detailed to Gen Dalla Chiesa. In the next few days Sen Lapenta, on orders from the commission's president, will officially ask Signora Eleonora Moro whether she plans to testify. If she does, the wife of the Christian Democrat leader slain by the BRs will herself chose the date of her appearance.

Further Details

Turin LA STAMPA in Italian 9 Jul 80 p 7

[Text] Moro Commission hears Carabiniere General. Dalla Chiesa: The Curcio group still plans a major role in terrorism." On Red Brigade member Patrizio Peci, who has turned state's evidence, Dalla Chiesa reportedly said: "I made him no promises in exchange for a confession." Secret of many of the successes of his operations: total secrecy of investigations.

Rome -- Terrorism these days seems to have hunkered down in a holding pattern to rethink its strategy; this circumstance must not be underestimated or taken as terrorist surrender or renouncing what are and will continue to be their goals: to subvert the democratic order. This is one of the statements Gen Carlo Alberto Dalla Chiesa made before the Moro Commission in the course of a hearing which began early yesterday afternoon and seems destined to last a good many hours more.

According to commission spokesman Sen Lapenta, Gen Dalla Chiesa gave the hearing an interpretation of the terrorist phenomenon studded with cultural references and insights. "A most interesting report," he said, and added, "which, thanks both to the subject matter and to the speaker's arresting personality, at times sounded as if it were taken straight out of a spy thriller."

The general began with a report of what he had done immediately after the crime in Via Fani. In the wake of Moro's kidnaping, he reportedly said, very few people saw in that incident the

terrible gravity of the terrorist phenomenon, although, looking back to the Red Brigades' strategic leadership resolution of 1977, one could have seen in it every reason for continuing alarm.

Lapenta said that the commission was favorably impressed with the methods Dalla Chiesa uses in his work, based as they are on careful observation of the way prisoners behave, of everything they write, and of the connections between their activities. Here Dalla Chiesa spoke at length of the role -- which he believes is still a major one in terrorism -- of the group headed by Curcio and Franceschini.

Dalla Chiesa then cited the major terrorist strikes over the past 2 years and added that much of the success he and his men have had was attributable to the secrecy in which their investigations were conducted. "And the only reward for these fellow-workers of mine has been the satisfaction of doing their duty." Then Lapenta quoted a sentence from Dalla Chiesa's report: "In a word, we rejected the safari pose, with one foot on the lion's head."

Dalla Chiesa then spoke of his meeting with Patrizio Peci; he guessed at once that the BR man was ready to talk, and concentrated on cultivating that readiness. Reporters asked Lapenta if Dalla Chiesa had said that he had taken the initiative in setting up the meeting with Peci. "And what," replied the senator, "if it was the terrorist who asked to talk to Dalla Chiesa?"

Dalla Chiesa did, however, deny that he had made any promises whatever to Peci in exchange for his confession; he had merely laid out for him the advantages he could gain from active collaboration with the forces of law.

Lastly, Lapenta said that in Dalla Chiesa's report (delivered almost entirely without notes), he had found "a sense of strategy" and a "profound and subtle understanding of the depth of terrorism, as well as of the efforts required to explain the causes of every single terrorist act."

This admiring view was seconded by another commissioner, Sen Scamarcio (PSI), who said: "It was a detailed report, and most of all an elegant one." And he added: "That's a smart man!"

On Friday morning -- Lapenta confirmed -- the commission will hear the CinC of the Carabinieri, General Cappuzzo, in the last hearing of this initial phase. Next Tuesday the commission will weigh all the solid evidence thus far gathered, and will then set up the timetable for the second phase of the inquiry.

COUNTRY SECTION SPAIN

BRIEFS

UCD/CATALONIAN MINORITY PACT--A political agreement between the government and the Catalonian Minority has been signed. According to this secret agreement Roca Junyet is to become minister for territorial administration and Anton Canellas will also join the cabinet. But the agreement may fizzle out due to Suarez' vacillations. [Text] [Madrid CAMBIO 16 in Spanish 10 Aug 80 p 5]

NATURAL GAS PIPELINE--The pipeline that starts at the regassification plant in Barcelona has begun to provide natural gas to the Valencia region due to the enlargement of the pipeline [system] near the city of Valencia. ENAGAS [expansion unknown] foresees that by the end of the year the gas pipeline will reach the city of Valencia, Vitoria and Zaragoza. It is expected that next summer the gas [pipeline] will reach the rest of Aragon and the Basque region. The length of the Spanish gas pipeline system is 1,014 km, of which 787 km. with 40 outlets has been built. The pipeline, located in "Spain's industrial triangle" (Basque region, Catalonia, and Valencia), entails a 36 billion peseta investment and will provide clean inexpensive energy for industry in twelve provinces. If the existence of natural gas in Cadiz is confirmed then the extension of the pipeline toward southern Spain will have to be considered. The south does not have this source of energy, which could provide Spain with 10 percent of its energy needs in 1990. [Text] [Madrid CAMBIO 16 in Spanish 20 Jul 80 p 28]

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